Music Theory for the 21st-Century Classroom

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University of Puget Sound

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Website:

Acknowledgements

I owe a huge thanks to Robert Beezer for recommending PreTeXt (formerly "MathBook XML") as a means to author *Music Theory for the 21st–Century Classroom*. His work creating the "world" of PreTeXt made it easier than I could have imagined to create this text in all its forms (online, PDF, and print).

Also of incredible value, and without whom this text would not exist, is Jahrme Risner, who helped me wrap my head around the nitty gritty of PreTeXt and patiently coached me through entering commands in the terminal.

I wish to thank my colleague, Gwynne Kuhner Brown, for co–piloting the use of this text at the University of Puget Sound and for suggesting extremely helpful clarifications and corrections.

Finally, I must thank my wife, Dawn Padula, Director of Vocal Studies at the University of Puget Sound and musician extraordinaire, for entertaining my endless questions about my choices for musical examples and the clarity of explanations and diagrams.

Preface

Music Theory for the 21st–Century Classroom is an openly–licensed online four–semester college music theory textbook. This text differs from other music theory textbooks by focusing less on four–part (SATB) voiceleading and more on relating harmony to the phrase. Also, in traditional music theory textbooks, there is little emphasis on motivic analysis and analysis of melodic units smaller than the phrase. In my opinion, this led to students having difficulty with creating melodies, since the training they are given is typically to write a "melody" in quarter notes in the soprano voice of part writing exercises. When the assignments in those texts ask students to do more than this, the majority of the students struggle to create a melody with continuity and with appropriate placement of harmonies within a phrase because the text had not prepared them to do so.

In *Music Theory for the 21st–Century Classroom*, students learn about motive, fragment, phrase, and subphrase, as well as types of melodic alteration like inversion, intervallic change, augmentation, diminution, rhythmic change, ornamentation, extension, and retrograde. By understanding motive and subphrase (also known as "phrase segment" or "phrase member"), I believe students will better understand the logic and construction of melodies, which will aid them in creating their own music.

This text is meant to take the student from the basics of reading and writing pitches and rhythms through twelve–tone technique and minimalism over the course of four semesters. Whenever possible, examples from popular music and music from film and musical theater are included to illustrate melodic and harmonic concepts, usually within the context of the phrase.

Performances of notated examples are linked to legal, copyrighted YouTube videos with the start and stop time embedded to prevent the instructor the need to search for the passage. The online nature of the text allows links between related concepts (including the index) as well as to relevant pages on the internet.

While I have considered creating a unique curriculum for the theory program at my university since 2001, the impetus to create an online music theory textbook that could be of use not only to my students but to students at other colleges came from reading "Transforming Music Study from its Foundations: A Manifesto for Progressive Change in the Undergraduate Preparation of Music Majors" by the College Music Society's Task Force on the Undergraduate Music Major.

The ideas in "the Manifesto," as it is often called—that colleges need to train students to be composer–performer–improvisers (and I would add "arrangers") like Bach and Beethoven as well as Charlie Parker and Jimmy Page—resonated with my musical experience growing up, which included writing, arranging, and playing popular music on electric guitar, electric bass, keyboards, and drumset

in high school—both in my uncle's home recording studio and with a garage band I formed. It also resonated with my experiences playing jazz and fusion as a professional bassist ever since I was in college, a situation where the majority of the basslines I play are improvised from lead-sheet symbols.

My Ph.D. is in composition with a supporting area in music theory. I teach students to write motets and fugues in the upper–division counterpoint class. I believe in compositional craft. I also acknowledge that there are many things one can value in music, including lyrics, groove, production, texture, emotion, harmony, virtuosity, and intellect, to name a few. In this textbook I try to cover as many as possible of these items that relate to how music is made and how understanding can enrich one's experience.

Robert Hutchinson
Tacoma, Washington 2017

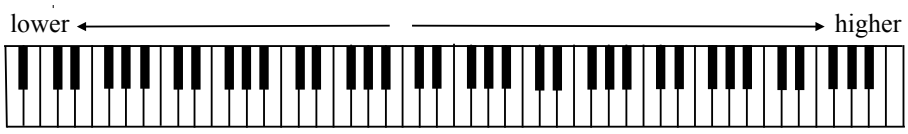
Contents

Chapter 1

Basic Concepts

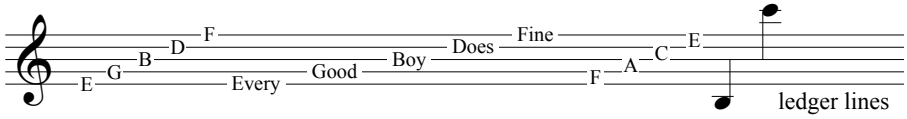
1.1 Pitch

Pitch has to do with notes. On the piano there are 88 notes. As you move to the right on a piano, the notes sound higher. Notes sound lower as you move to the left. Try it on a piano with a smaller range at the following website.

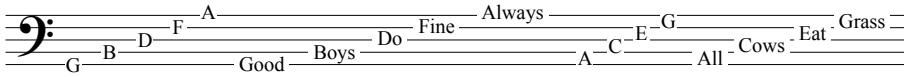


1.2 Notation

Notes are written on a five-line **staff**. A **clef** orients the lines to a reference point. For example, the G clef, when placed on a five-line staff, becomes the **treble clef**, the most well known clef. In treble clef, the notes on the lines are E–G–B–D–F from lowest to highest, often remembered through the traditional mnenomic "Every Good Boy Does Fine." The spaces are F–A–C–E from lowest to highest. Staves (the plural of "staff" in musical terminology is "staves") are extended by the **ledger lines**.



The F clef, when placed on a five-line staff with the dots surrounding the second line from the top, creates the **bass clef**. See the example for the names of lines and spaces, and for mnemonics to remember them.



1.3 Octave Registers

The note names used in music are ABCDEFG (known as the "musical alphabet"). After G, the note A returns and ABCDEFG occurs again and again.

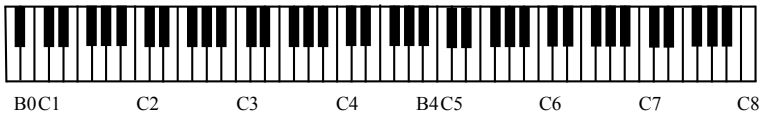
The distance from the first A to the second A is an octave (which means the notes are eight steps apart.)

A	B	C	D	E	F	G	A
1	2	3	4	5	6	7	8 (octave)

The distance from any note to a note of the same name in the next register above or below is called an **octave** (abbreviated "**8ve**").

How can the piano keyboard have 88 notes when there are only seven note names? The musical alphabet repeats 7 times (with an extra ABC at the top), which means we have at least seven octave registers. (There are also five chromatic notes in each register, which we will learn about when we discuss Accidentals.) When learning about octave registers, we will focus on the note C for reasons that will soon become clear when we learn about the major scale.

We use **octave registers** (C_4, D_5, etc.) to specify the exact register of a note. The note C_4 is known as "**middle C**" and is an important reference point. See the keyboard in the example below.



Note that *the register number changes after the note*B each time (B_4 is followed by C_5).

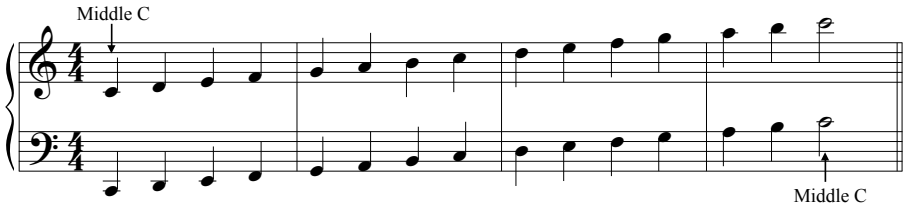
In treble clef, middle C is notated on the ledger line below the staff. In bass clef, middle C is notated on the ledger line above the staff.

Figure 1.3.1 Middle C (C4) in treble clef and bass clef

The other two commonly used clefs are **alto clef** and **tenor clef**. Each use a C clef that, when placed on a staff, designate the placement of middle C.

Figure 1.3.2 Middle C in alto clef and tenor clef

The **grand staff**, which is a treble and bass clef joined together by a bracket, is how piano music is written.



Note that middle C is always clearly notated in either the upper or lower staff and never floats between the two staves.

1.4 Accidentals

There are five types of accidentals; **accidentals** are characters that can be placed before notes to raise or lower them.

- The **sharp** symbol—♯—raises a pitch a half step.
- The **flat** symbol—♭—lowers a pitch a half step.
- The **double sharp** symbol—𝄪—raises a pitch two half steps, or a whole step.
- The **double flat** symbol—𝄫—lowers a pitch two half steps, or a whole step.
- The **natural** symbol—♮—cancels out any other accidentals that may have occurred earlier in a measure or in Major Key Signatures or Minor Key Signatures.

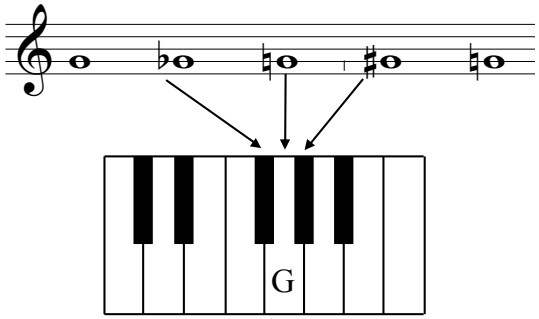


Figure 1.4.1

1.5 Enharmonic Notes

Observe that $C^{\sharp}$ and $D^{\flat}$ are the same note on the piano but are written as different notes on the staff.

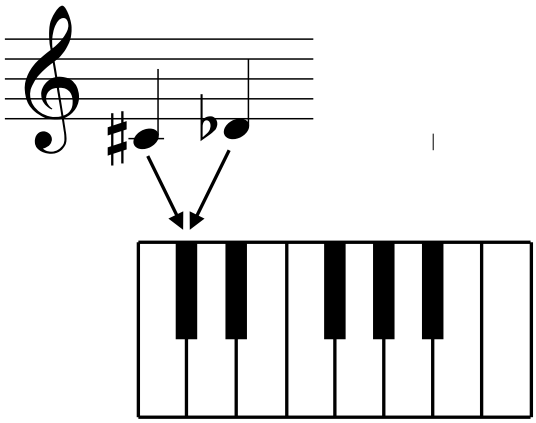


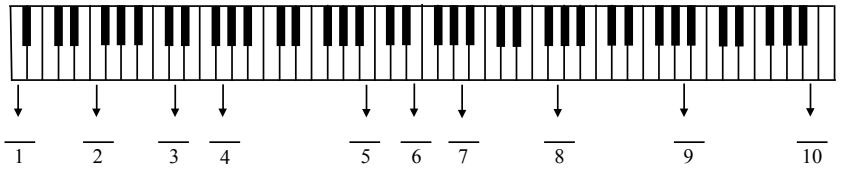
Figure 1.5.1

This occurs with all the black keys on the piano ($C^{\sharp}$=$D^{\flat}$, $D^{\sharp}$=$E^{\flat}$, $F^{\sharp}$=$G^{\flat}$, $G^{\sharp}$=$A^{\flat}$, $A^{\sharp}$=$B^{\flat}$). When two notes *sound* the same but are written as two different notes on the staff, the written notes are said to be **enharmonic**. Notes

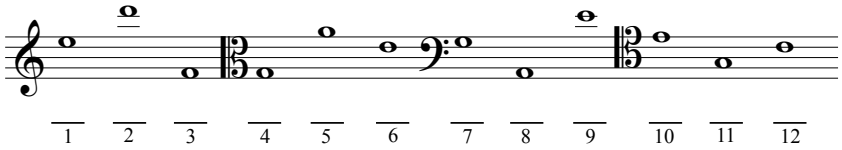
on the white keys of the piano can be written enharmonically as well (C=B$^{\sharp}$, E=F$^{\flat}$, D=C$^{\times}$, etc.).

1.6 Practice Exercises

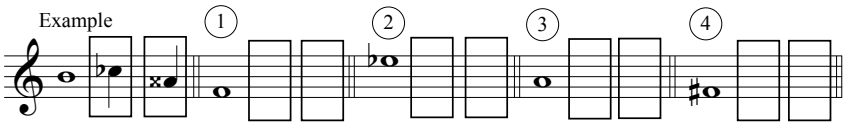
1. For each note on the piano keyboard, specify the note name and octave register.



2. For each note on the staff, specify the note name and octave register.



3. Provide two enharmically equivalent notes for each given note.



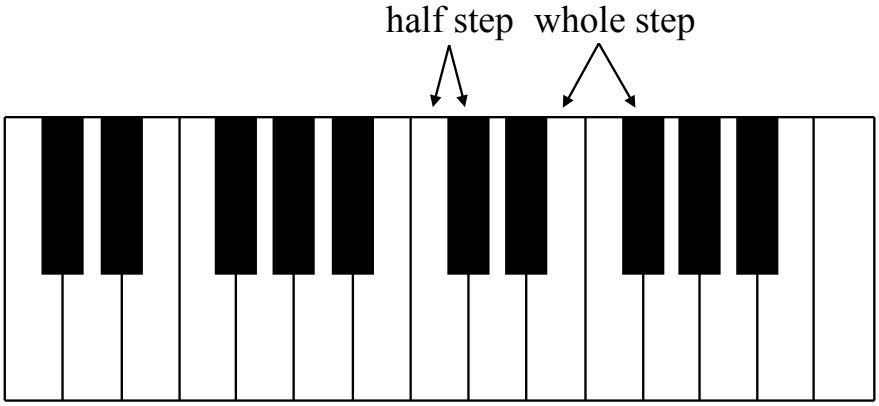
PDF versions of the textbook, homework exercises, and practice exercises can be found at musictheory.pugetsound.edu

Chapter 2

Major Scales and Key Signatures

2.1 Half Steps and Whole Steps

A half step on a piano keyboard is the distance from one note to the next nearest note. A whole step is made of two half steps.



2.2 The Major Scale

A major scale contains a specific succession of whole and half steps. It is helpful to think of the pattern as consisting of two tetrachords. (A **tetrachord** is a four-note scale segment.) The lower tetrachord consists of the pattern whole step, whole step, half step. A whole step joins the lower tetrachord to the upper tetrachord. The upper tetrachord duplicates the pattern in the lower one: whole step, whole step, half step. If we use W for whole step and H for half step, the major scale pattern is W–W–H, Whole–step connection, W–W–H.

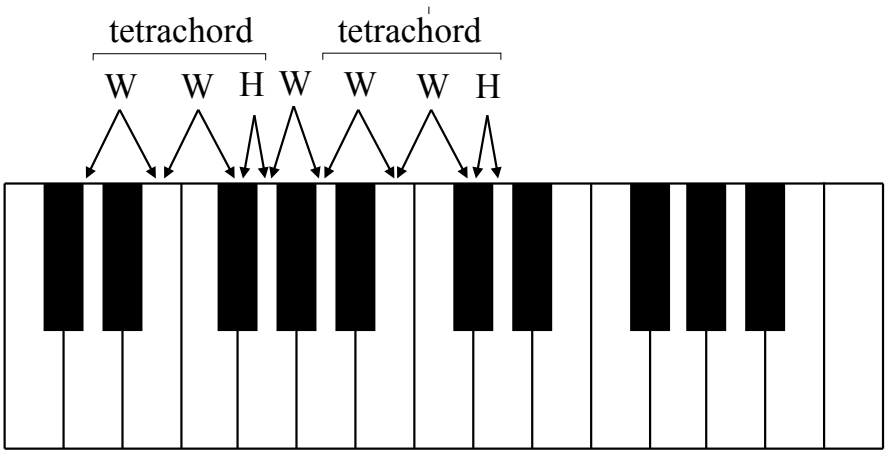


Figure 2.2.1 The D major scale on a keyboard

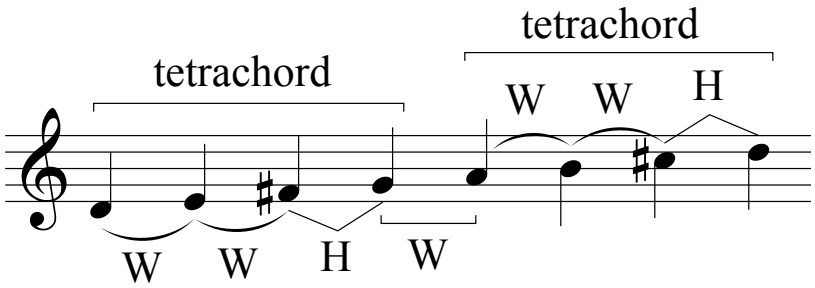


Figure 2.2.2 The D major scale in treble clef

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All major scales use the notes of the musical alphabet in order; no notes are skipped and no notes occur twice. In the example above, the first four notes are D–E–F$^{\sharp}$–G, not D–E–G$^{\flat}$–G. In D–E–G$^{\flat}$–G, G erroneously occurs twice and the F$^{\sharp}$ between E and G is skipped.

2.3 Major Key Signatures

A key signature is placed at the beginning of a piece (or the beginning of a section) and is written with the clef on the beginning of each line of music. The **key signature** reminds the performer which sharps or flats are in the scale (or key) of the piece and prevents the composer or arranger from writing every sharp or flat from the scale every time it occurs.

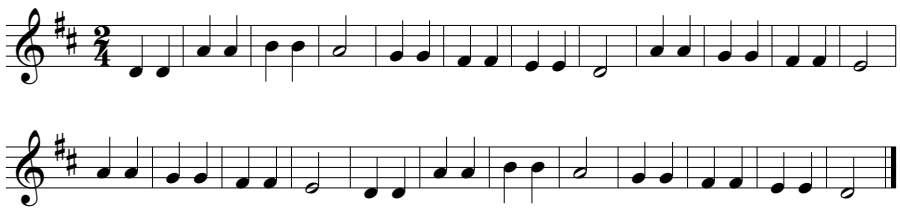


Figure 2.3.1 "Twinkle, Twinkle, Little Star" in D major

There are 15 major key signatures. The key of C major has no sharps or flats in the key signature. The other key signatures can have between 1 to 7 sharps and 1 to 7 flats, giving us the other 14 key signatures.

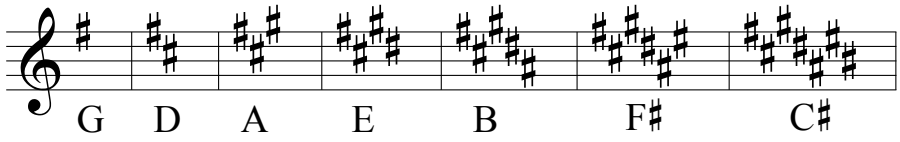


Figure 2.3.2 Major Key Signatures using Sharps

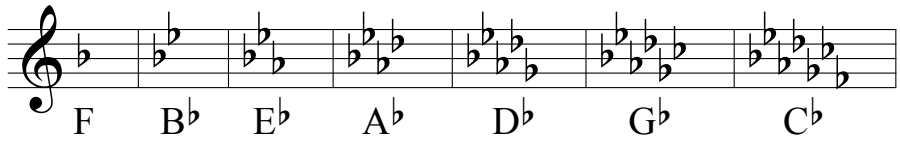


Figure 2.3.3 Major Key Signatures using Flats

It is important to memorize the order of sharps and flats, since you will be writing key signatures regularly.

The **order of sharps** is F–C–G–D–A–E–B, often remembered by a mnemonic. One common mnemonic for the order of sharps is "Fast Cars Go Dangerously Around Every Bend."

The **order of flats** is B–E–A–D–G–C–F. It is the reverse of the order of sharps. It is easy to remember since the first four letters make the word BEAD, and GCF is something most students learn as "Greatest Common Factor" when studying math in elementary school.

A mnemonic that works forward and backward is "Father Charles Goes Down And Ends Battle," which reversed is "Battle Ends And Down Goes Charles' Father."

A helpful learning device to remember the order of keys in relation to the order of sharps and flats is the **circle of fifths**. As you ascend in fifths (clockwise), key signatures get one degree "sharper." (C to G is a fifth because C=1, D=2, E=3, F=4, and G=5.) As you descend in fifths (counterclockwise), key signatures get one degree "flatter."

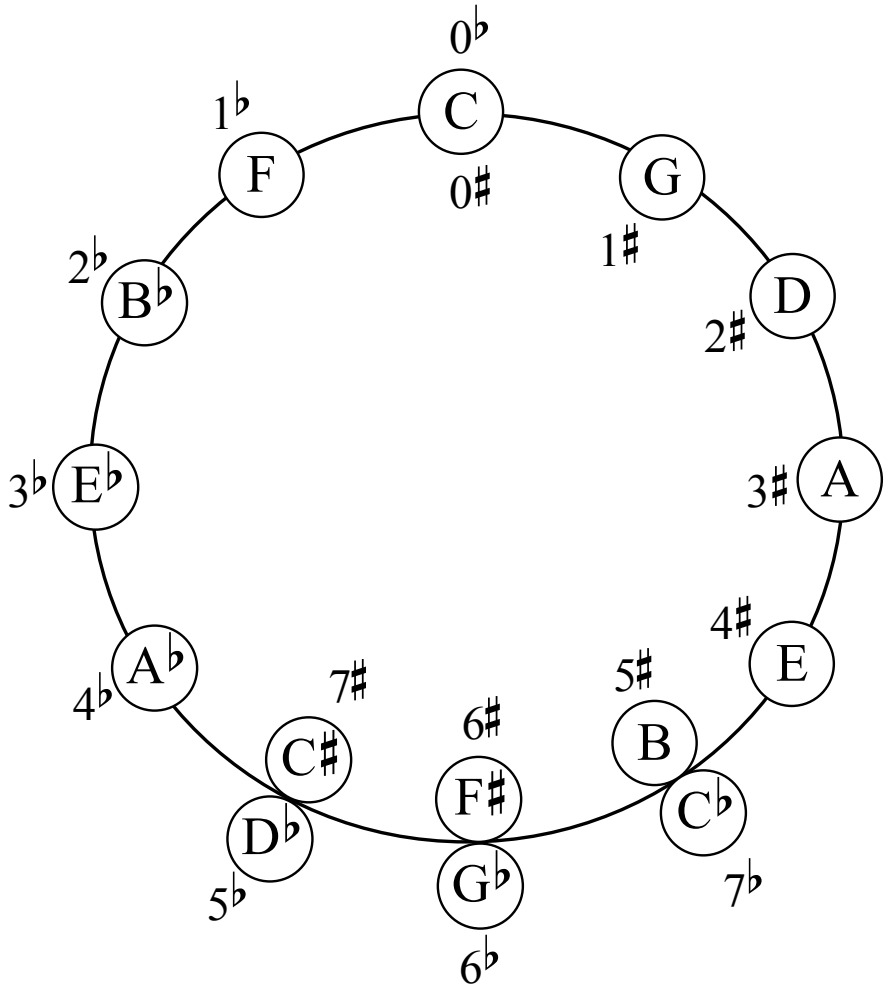


Figure 2.3.4 Circle of Fifths for Major Keys

Note the overlapping keys at the bottom of the circle. B major is enharmonically the same as $C^{\flat}$ major, $F^{\sharp}$ major is enharmonically the same as $G^{\flat}$ major, and $C^{\sharp}$ major is enharmonically the same as $D^{\flat}$ major.

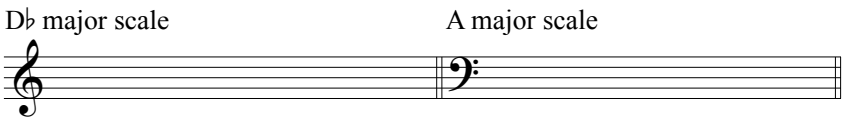
2.3.1 Identifying Key Signatures

While it is preferable to memorize key signatures, use the following method to determine major key signatures based on the sharps or flats in the key signature.

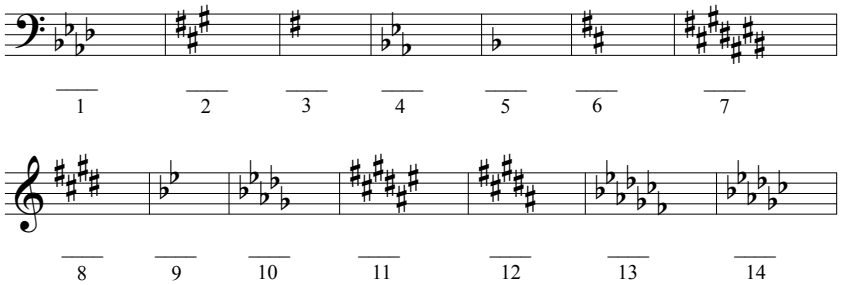
1. *For key signatures withs sharps*: Go up a half step from the last sharp to find the key.
2. *For key signatures with flats*: The second-to-last flat is the key.

2.4 Practice Exercises

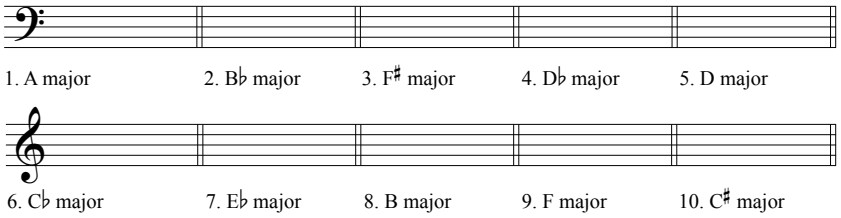
1. Using the WWHWWWH pattern, write the specified major scales without using key signatures.



2. Given the key signature, specify the major key.



3. Write the major key signature for each key given. Be sure to use the correct order for sharps and flats.



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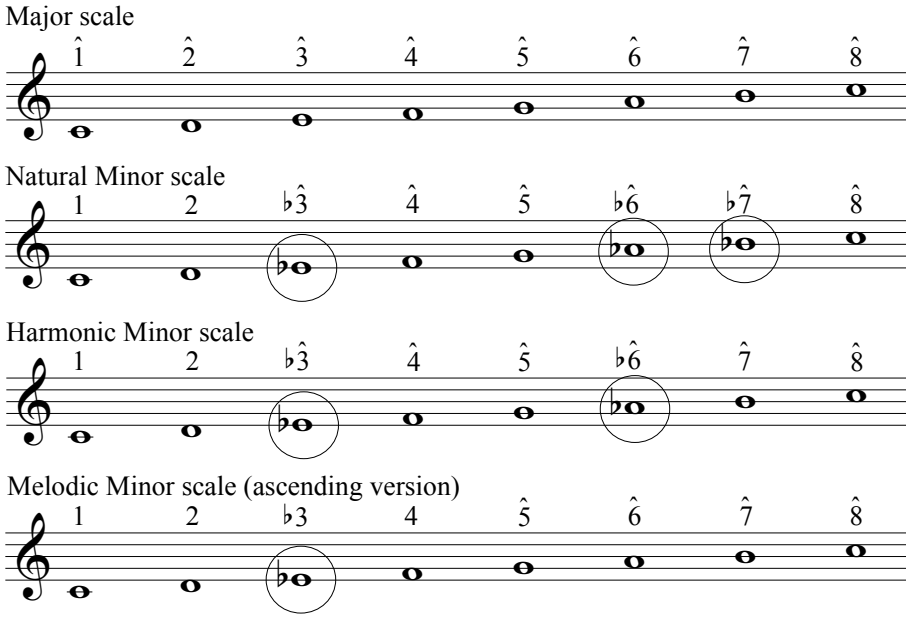
Chapter 3

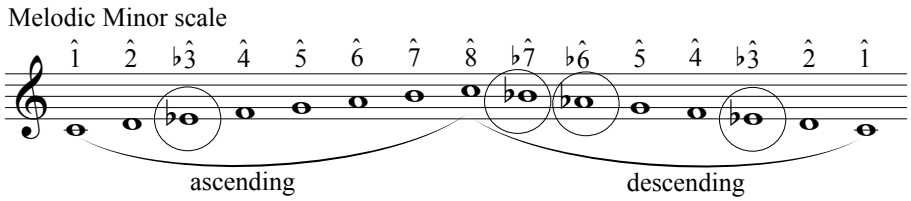
Minor Scales and Key Signatures

3.1 Minor Scales

There are three minor scales: the **natural minor** scale, the **harmonic minor** scale, and the **melodic minor** scale. Play or sing through each one and notice the differences.



The melodic minor scale has an ascending version, shown above, and a descending version that is the same as the natural minor scale.

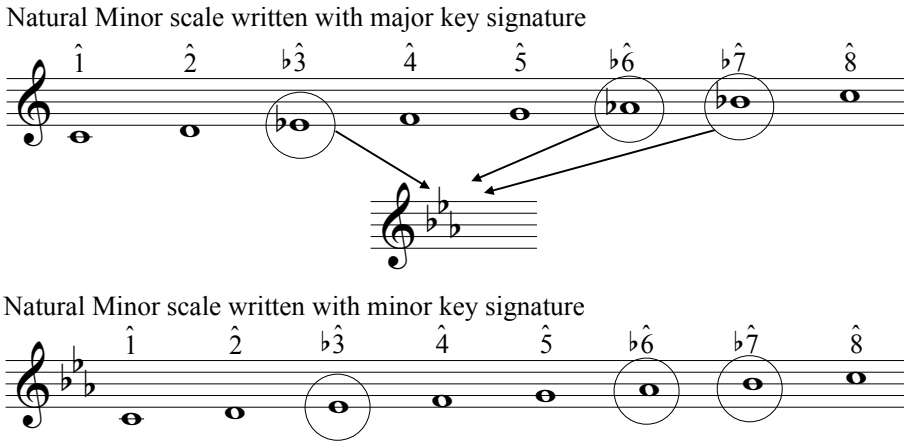


So far, we have looked at minor scales in relation to the major scale. However,

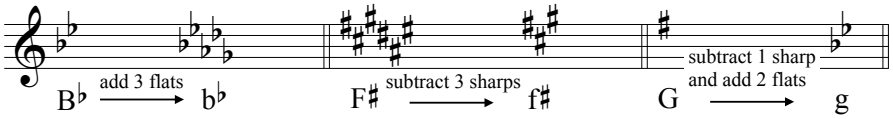
we will typically encounter minor scales in music using minor key signatures.

3.2 Minor Key Signatures

Minor key signatures agree with the notes of the natural minor scale. Since the C natural minor scale had E♭, A♭, and B♭, the key signature of C minor has three flats, written in the order of flats—B♭, E♭, A♭.

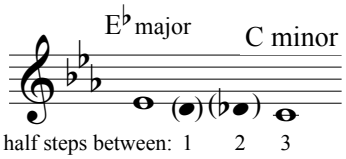


Therefore, a minor key signature will have three lowered notes—the 3rd, 6th, and 7th—in relation to the corresponding major key signature. We use the term **parallel minor** when referring to a minor scale that *has the same 1st scale degree* (in this case C) as the major. We say, "The parallel minor of E major is E minor," and "The parallel major of F minor is F major." One method of figuring out a minor key signature is to add three flats to the parallel major key signature. This is the same as subtracting three sharps.

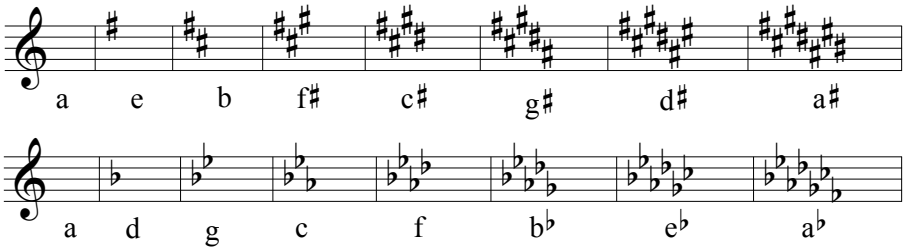


Note on uppercase versus lowercase: When writing below the five-line staff to designate keys, we will use the shorthand of upper case for major (C) and lowercase for minor (c). When writing prose, we will use uppercase: C major and C minor.

We use the term **relative minor** when referring to a minor key that *has the same key signature* as a major key. For example, the relative minor of E♭ major is C minor because both have three flats in the key signature. Conversely, one could say the relative major of C minor is E♭ major. The relative major is three half steps *above* the relative minor.



Below are the minor key signatures.



Here are circle of fifths diagrams for both major and minor, for comparison.

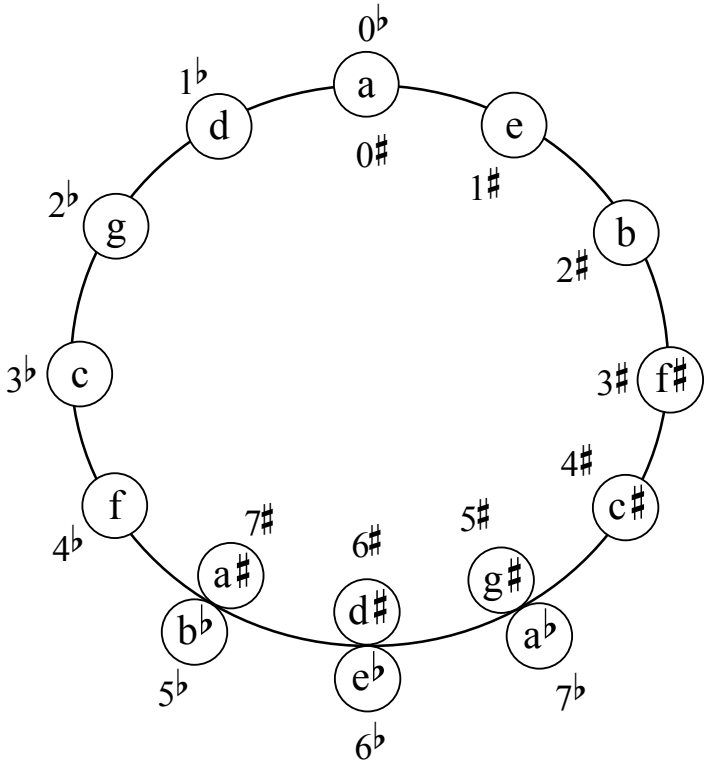


Figure 3.2.1

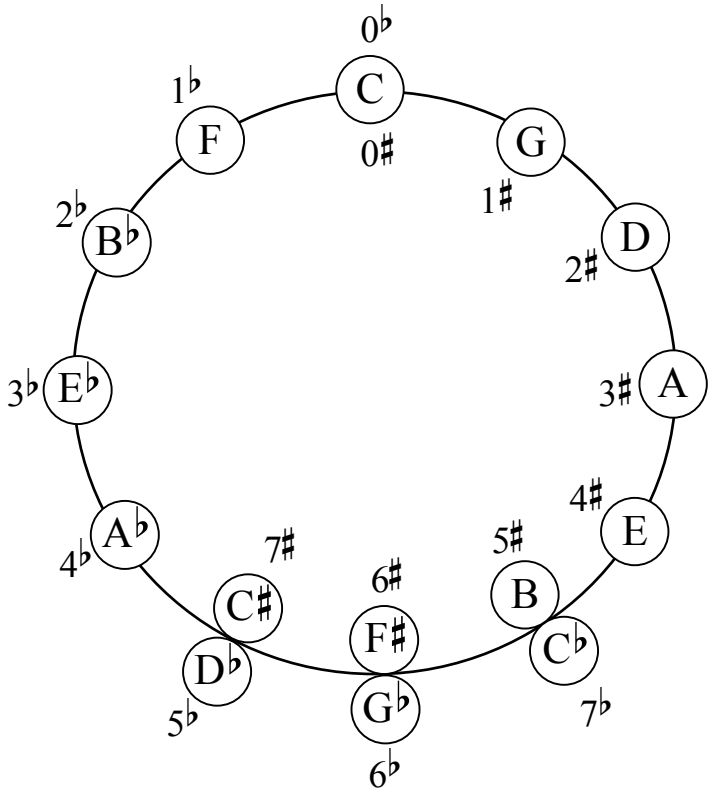
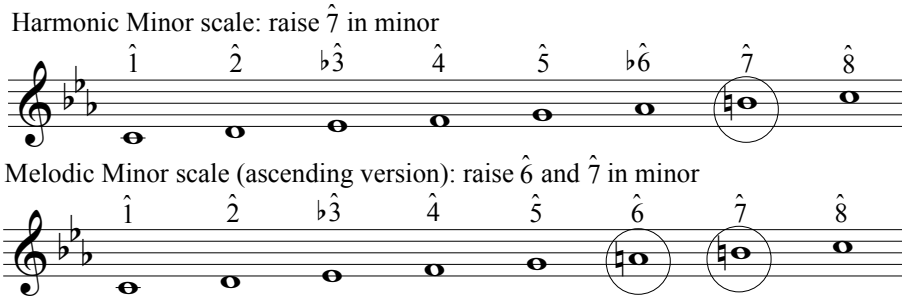


Figure 3.2.2

Writing harmonic minor and melodic minor scales *when using minor key signatures* requires you to *raise* scale degrees.



Compositions in minor typically do not strictly use only one of the three minor scales, however. The three minor scales are distillations of composers' actual practice.

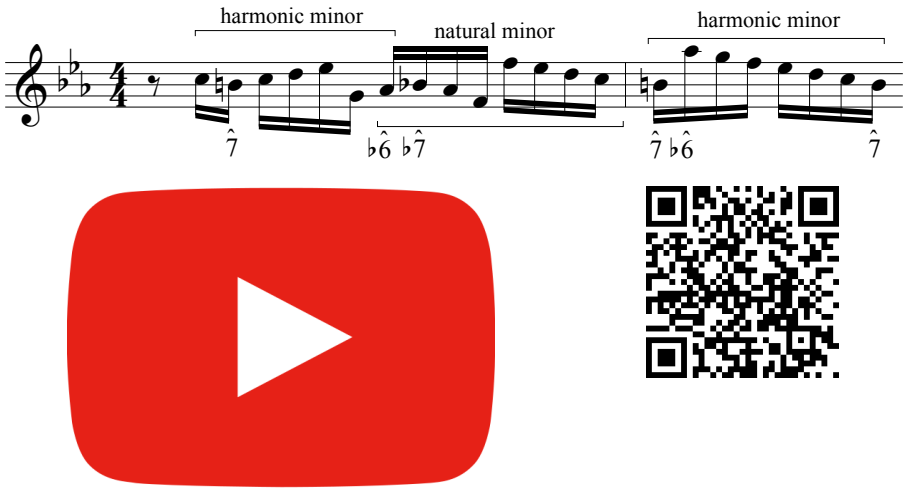


Figure 3.2.3 J.S. Bach, C Minor Invention

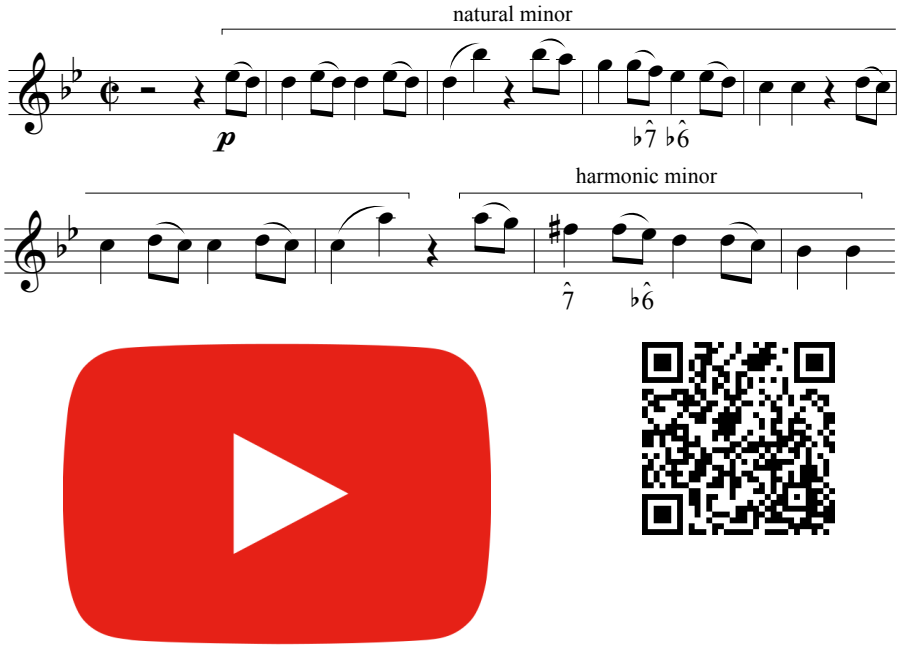


Figure 3.2.4 Mozart, Symphony No. 40 in G Minor, K. 550, 1st movement

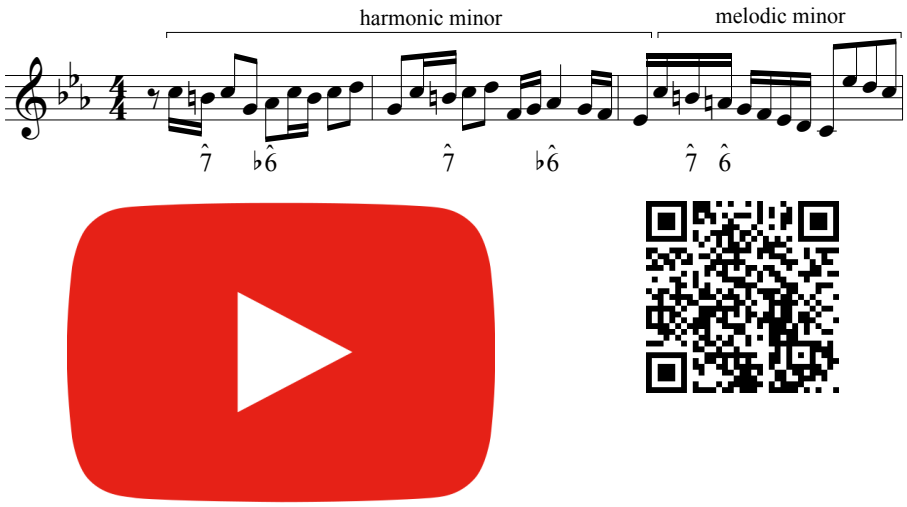
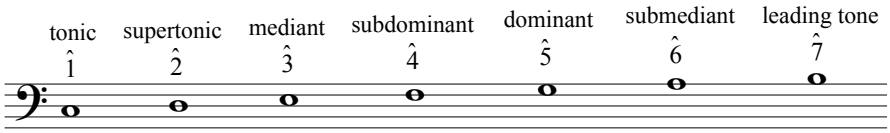


Figure 3.2.5 J.S. Bach, Well-Tempered Clavier, Book One, Fugue 2 in C Minor

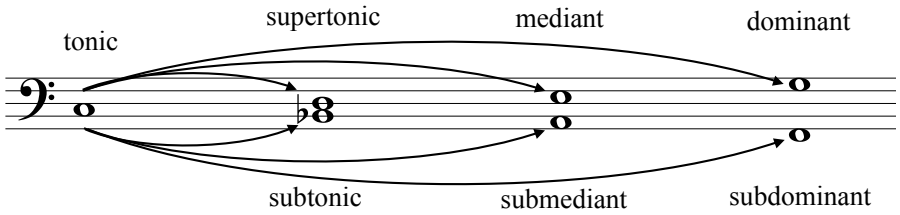
3.3 Scale Degree Names

Scale degrees, though often referred to by numbers, also have names.



These names will be used throughout this text to refer to scale degrees, chords built on these scale degrees, and keys associated with these scale degrees.

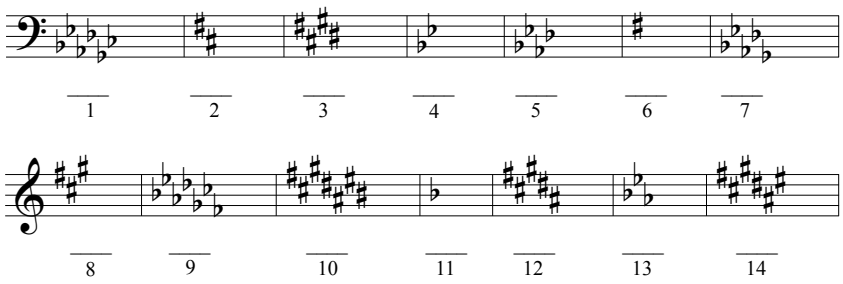
Another way to understand why some scale degrees have "sub-" in their names is through the following example.



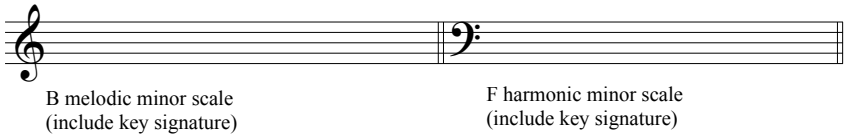
Notice that the *subtonic* is a whole step below the tonic, while the *leading tone* is only a half step below the tonic.

3.4 Practice Exercises

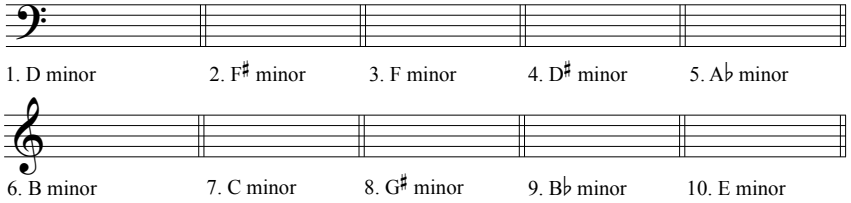
1. Specify the minor key for each key signature given.



2. Write the minor key signature and specified minor scale in each example.



3. Write the minor key signature for the given key in each example.



4. Specify the key from the scale degree name.

(a) _____ minor: A♭ is the mediant

(b) _____ minor: D♭ is the subtonic

(c) _____ major: B is the dominant

(d) _____ major: C is the submediant

(e) _____ minor: D♯ is the subdominant

(f) _____ major: B♭ is the leading tone

(g) _____ minor: E♯ is the supertonic

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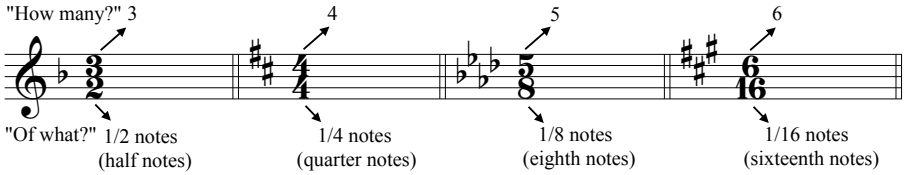
Chapter 4

Basics of Rhythm

In relation to rhythm in music, we will discuss time signatures, durational symbols, meter, beat, pulse, tempo.

4.1 Time Signature

In a **time signature**, the top number of the time signature tells you "how many" and the bottom number tells you "of what."



4.2 Durational Symbols

In the present day, the most common time signature is $\frac{4}{4}$ (also known as "common time"). It makes sense to introduce durational symbols in the context of $\frac{4}{4}$ because a whole note takes up a whole measure in $\frac{4}{4}$, a half note takes up half a measure of $\frac{4}{4}$, a quarter note takes up $\frac{1}{4}$ of a measure, and so on.

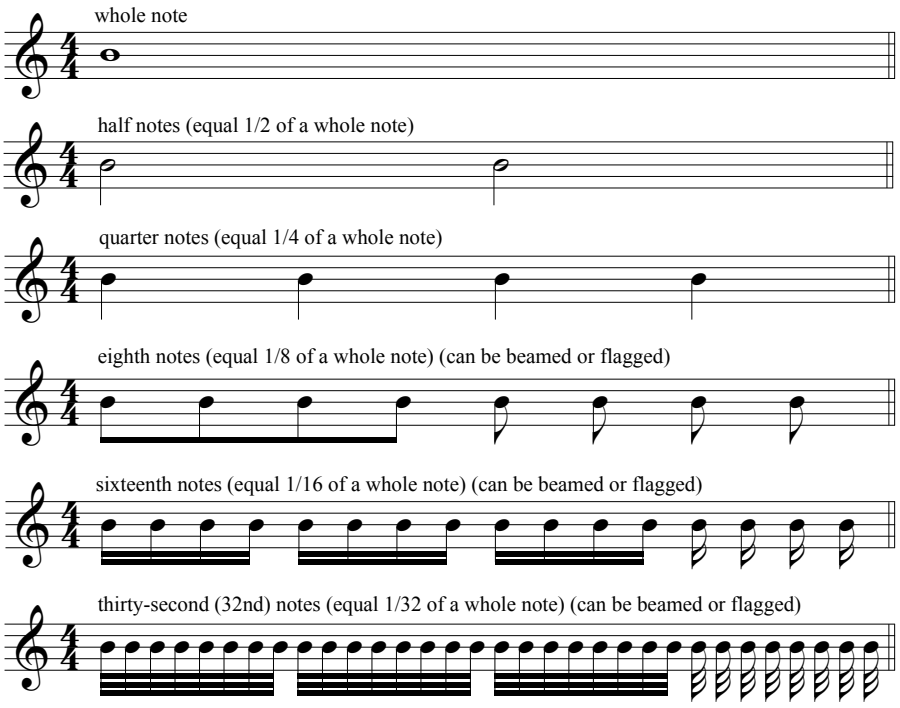
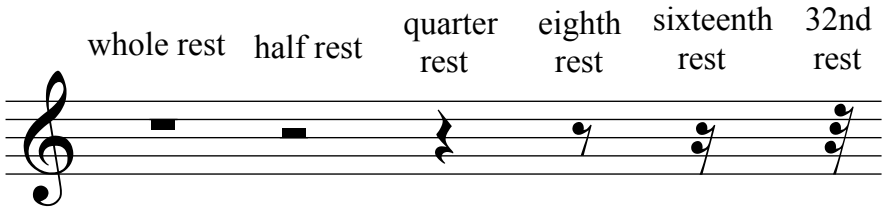
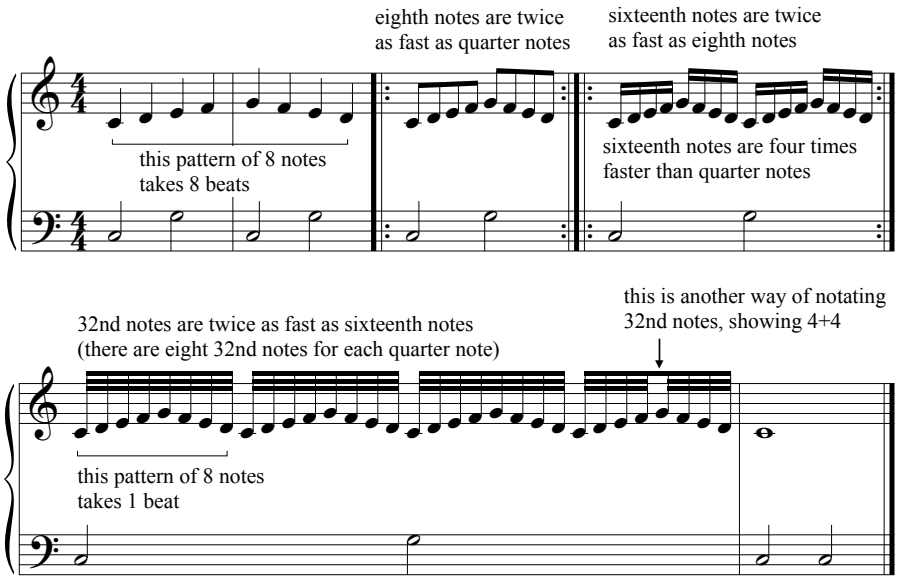


Figure 4.2.1

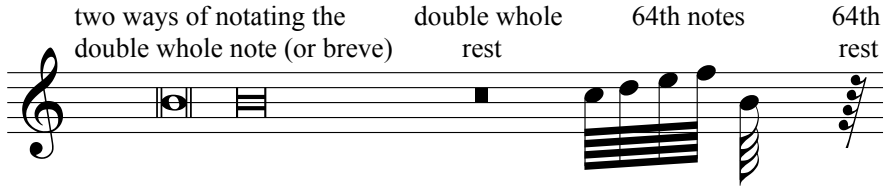
Here are durational symbols for rests.



To put this information into practice, listen to the durational values double in speed in each measure of the following example.



Two rare durational values are the double whole note (also called a "breve") and the 64th note, which is twice as fast as a 32nd note.

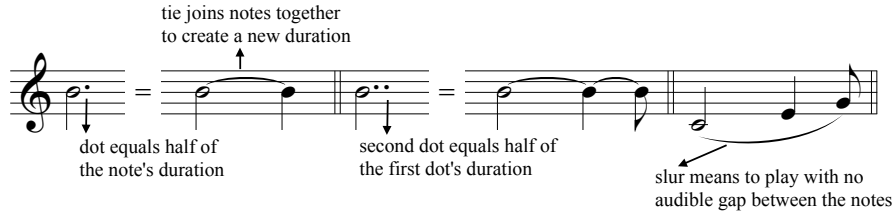


4.3 Dots and Ties

We have a whole note, which lasts for four beats, and a half note, which lasts for two beats, but we don't have a durational value that lasts three beats. To do so requires using a dot or a tie.

A **tie** links two notes together to create a new duration. Ties occur between notes of the same pitch. A **slur**, which looks like a tie, is placed over or under notes of different pitches and means to play them in a connected manner.

A **dot** added to a note increases the duration of that note by half. A second dot represents half the value of the first dot, or a quarter of the original duration. (These are known as "double-dotted notes.")



4.4 Meter

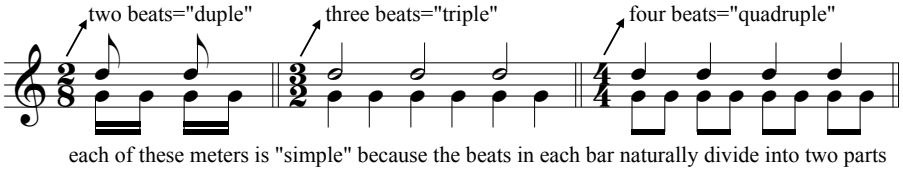
Meter describes the number of beats in a measure (also know as a "bar") and how the beats are normally divided.

Beat is "[t]he basic pulse underlying measured music and thus the unit by which musical time is reckoned..." according to Barry Kernfeld in *The New Grove Dictionary of Jazz*, 2nd edition. **Pulse** and beat are synonymous.

Tempo refers to the speed of the beat or pulse. Tempo can be referred to in **beats per minute** (**bpm**), such as 60bpm (where the rate of the beat would be equal to a second), or, in classical music, with terms like Allegro, Andante, and Adagio, sometimes in combinations with "**M.M.**" for **Maelzel's Metronome**.

Meters with two beats in a bar are described as *duple*. If there are three beats in a bar, the meter is described as *triple*, and if there are four beats in a bar, the meter is described as *quadruple*.

If the beats are normally divided into two parts, the meter is described as **simple**. If the beats are normally divided into three parts, the meter is described as **compound**.

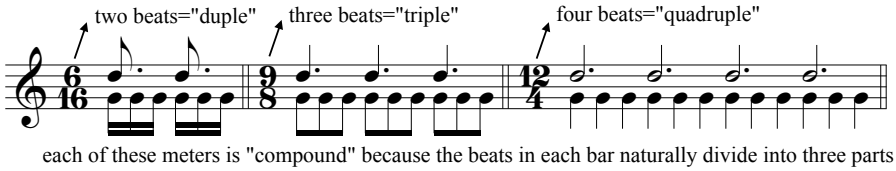


The time signature $\frac{2}{8}$ is "simple duple meter." The time signature $\frac{3}{2}$ is "simple triple meter." Finally, $\frac{4}{4}$ is "simple quadruple meter."

When describing meter, we say how the beat is divided before the number of beats in the measure.

$$\text{Meter} = \underbrace{\text{("simple" or "compound")}}_{\text{(how the beat is divided)}} \ \underbrace{\text{("duple," "triple," or "quadruple")}}_{\text{(the number of beats)}}$$

With compound meters the bottom number specifies *the division of the beat.* The beat value is a dotted note. We say $\frac{6}{16}$ is "compound duple meter" because it has two beats. The time signature $\frac{6}{8}$ is also compound duple. Compound time signatures have a top number greater than four that is divisible by 3 (6, 9, 12).



The following table summarizes meter and time signatures.

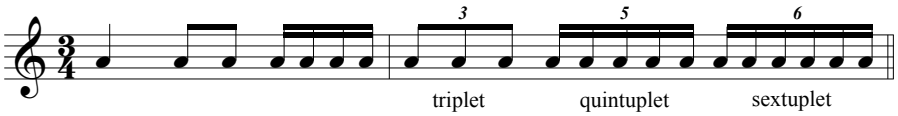
Top number of time signature:	2	3	4	= Simple
Top number of time signature:	6	9	12	= Compound
Number of beats:	Duple	Triple	Quadruple	

4.5 Tuplets

Tuplet is a generic term that describes a grouping of notes that would not normally occur within a beat.

A quarter note naturally divides into two eighth notes or four sixteenth notes. A **triplet** is a grouping of three eighth notes that occurs within the

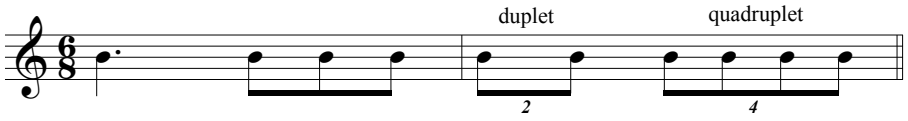
span of the quarter note. A **quintuplet** would be a grouping of five sixteenth notes to occur within the span of one quarter note. It is not uncommon to see quintuplets, sextuplets, and septuplets.



If you write a piece of music that naturally has a triplet division to the beat, you should use $\frac{6}{8}$, $\frac{9}{8}$ or $\frac{12}{8}$ depending on the number of beats in each measure.

Figure 4.5.1 Two measures that sound the same

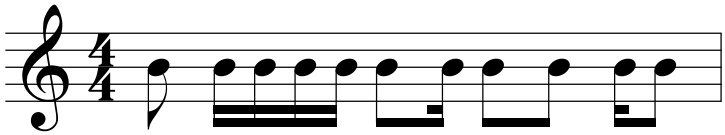
In compound meter, a **duplet** is a grouping of two eighth notes to occur within the span of a dotted quarter note and a **quadruplet** is a grouping of four eighth notes to occur with the span of a dotted quarter note.



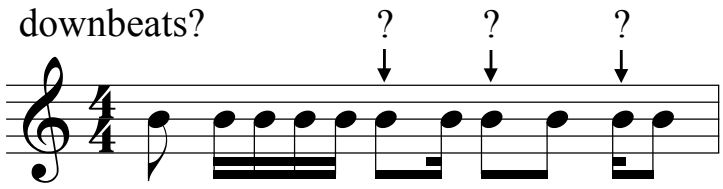
4.6 Common Rhythmic Notation Errors

The standard practice when notating rhythms is to use beaming to show where the beginning of each beat occurs.

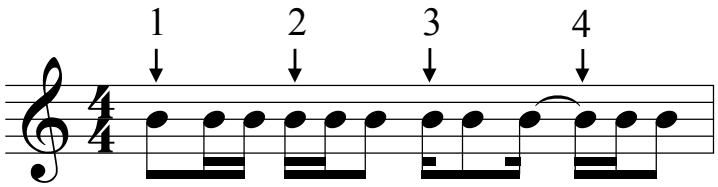
Consider the following example:



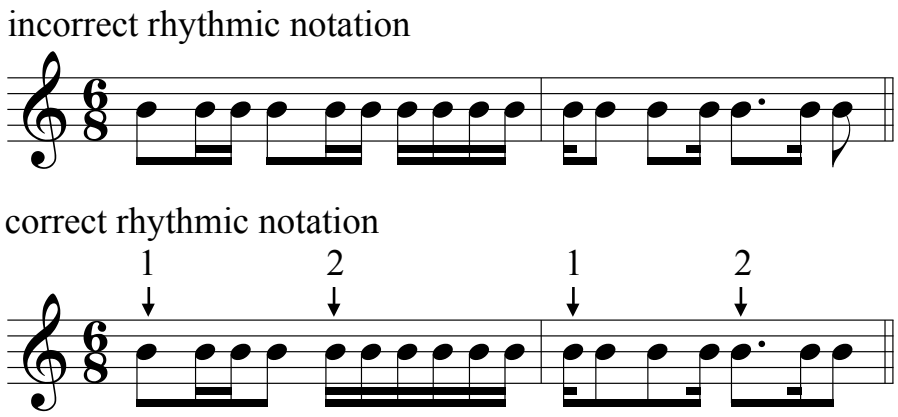
It is difficult to discern where the downbeats are.



Here is the same rhythm correctly notated. The downbeats provide a reference point, matching the conductor's beat pattern or your tapping toe.



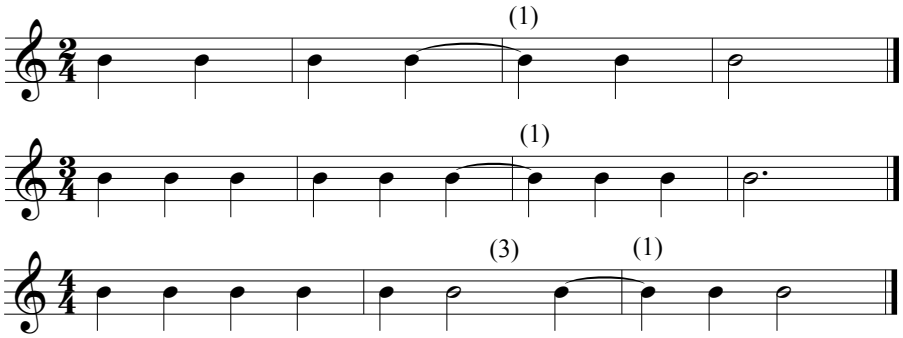
In compound meters like $\frac{6}{8}$, the beat is the dotted quarter.



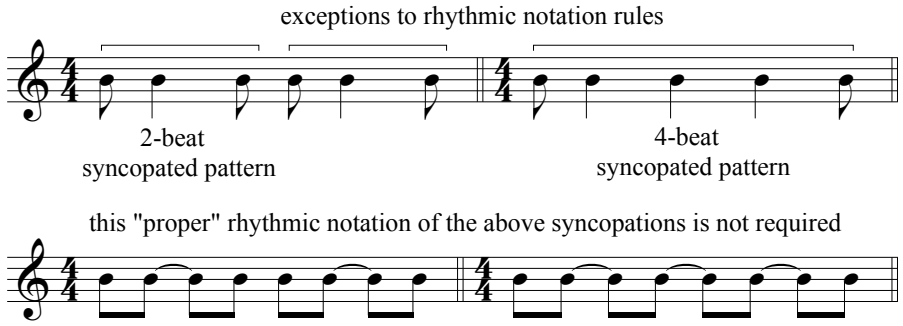
The exception to this practice of "showing the beats" involves syncopation, which is common in popular music.

Definition 4.6.1 Syncopation occurs when notes on weak beats and on weak parts of beats are emphasized and nearby strong beats are deemphasized. ◊

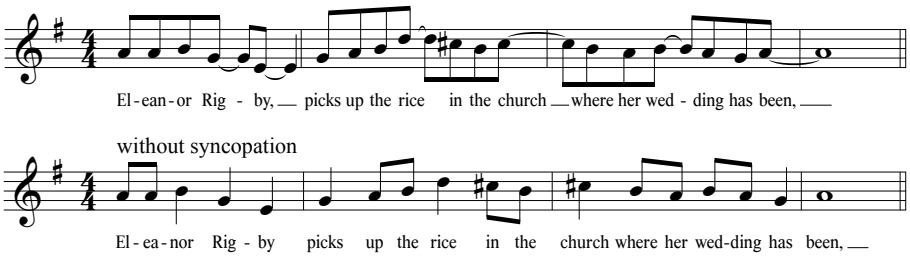
Strong beats are the first beat of each measure (in $\frac{2}{4}$ and $\frac{3}{4}$) and beats 1 and 3 in $\frac{4}{4}$. Syncopation *at the beat level* involves ties across those strong beats. Numbers in parentheses in the example below are beats that are obscured through syncopation.



Syncopation can also occur at the *division of the beat* level. Below are two syncopation figures that don't show the beat but are acceptable because they are common and to write them out correctly involves more symbols (beamed eighths and ties) for the performer to comprehend.



An example of syncopation at the eighth-note level (the division of the beat) can be found in the following example from "Eleanor Rigby."



Notice how syncopating notes gives them emphasis and creates a "pull" against the rhythm of the accompaniment.

4.7 Practice Exercises

1. After listening to each example, specify the meter (e.g., "compound triple").

(a) Lin-Manuel Miranda, "First Burn"

(b) Al Green, Willie Mitchell, Al Jackson Jr., "Let's Stay Together"

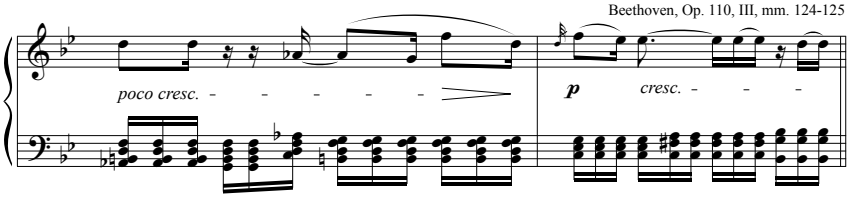
(c) Pat Metheny and Lyle Mays, "Minuano (Six Eight)"

(d) Traditional Scottish Gaelic tune, text by Eleanor Farjeon, "Morning Has Broken"

(e) Guy Lawrence, Howard Lawrence, James Napier, and Sam Smith, "Disclosure"

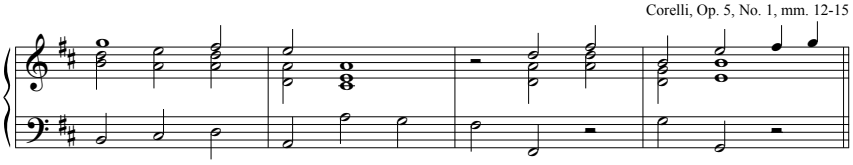
2. For each example, specify the implied time signature and the meter (e.g., "simple duple").

Beethoven, Op. 110, III, mm. 124-125



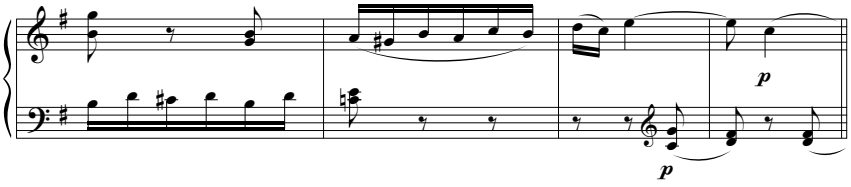
a. Time Signature: _____ Meter: _____ _____

Corelli, Op. 5, No. 1, mm. 12-15



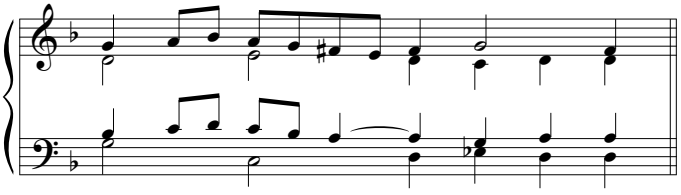
b. Time Signature: _____ Meter: _____ _____

Mozart, K. 283, III, mm. 187-190



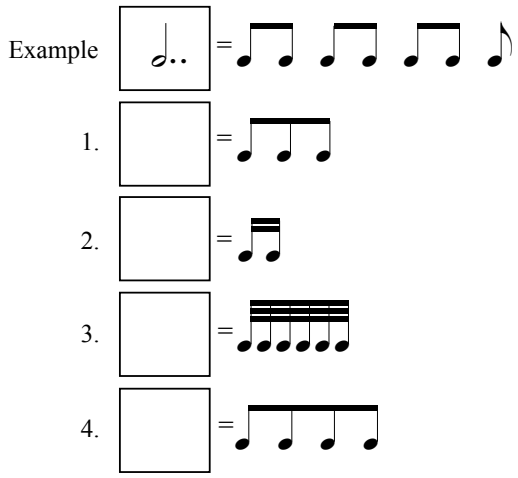
c. Time Signature: _____ Meter: _____ _____

Gervaise, "Pavane Passamaize" from *Sixième Livre de Danceries*, m. 7



d. Time Signature: _____ Meter: _____ _____

3. Use one note value (with one or two dots as necessary) to show the sum of all the rhythmic values given.



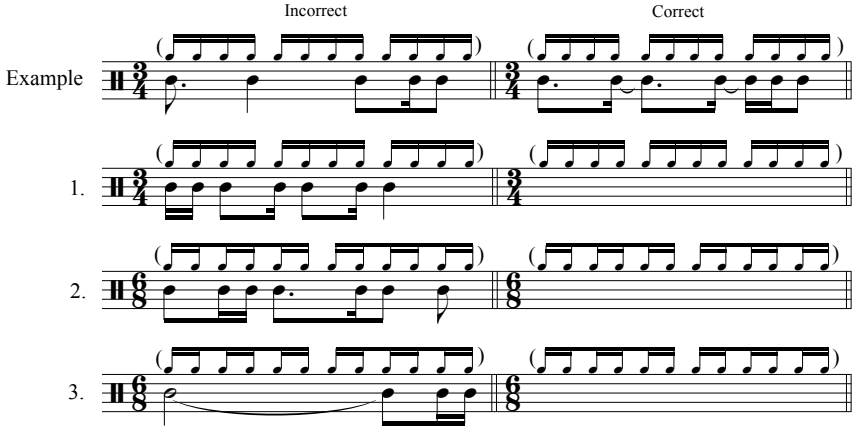
4. Specify the meter of each time signature.

(a) The meter of $\frac{4}{2}$ is: _____

(b) The meter of $\frac{9}{16}$ is: _____

(c) The meter of $\frac{3}{4}$ is: _____

5. Correct the incorrect rhythmic notation in each example in order to show the beats. The subdivisions grouped into beats are shown in parentheses above the rhythms to be corrected.



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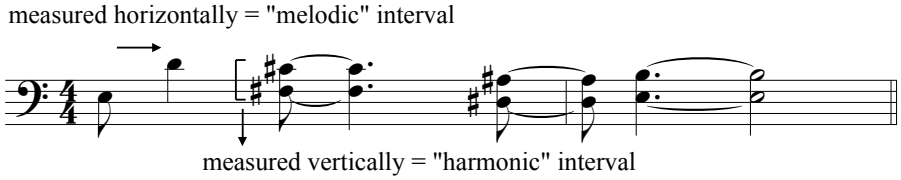
Chapter 5

Intervals

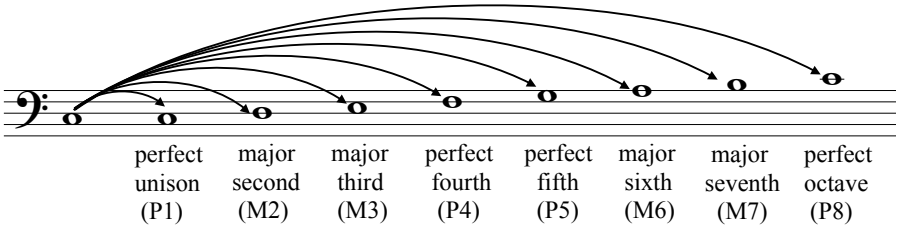
In order to prepare for the study of triads in the next chapter, we will focus primarily on major and minor seconds, thirds, and sixths, and perfect, diminished, and augmented fourths and fifths. We will leave discussion of augmented and diminished sixths and sevenths for the chapters on Seventh Chords and Augmented Sixth Chords. We will return to Section 5.5 at that time.

5.1 Introduction to Intervals

Intervals are the building blocks of scales, chords (or harmonies), and melodies. **Intervals** are a measurement between two pitches, either vertically or horizontally. When measuring vertically, we refer to **harmonic intervals** because the two notes sound simultaneously. When measuring horizontally, we refer to **melodic intervals** because the notes occur one after the other.



When you measure from the tonic up to each scale degree of a major scale, you find the following intervals:

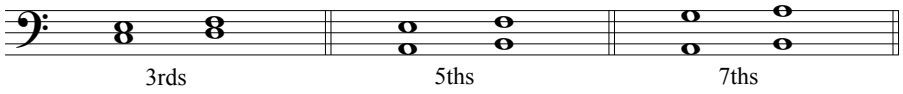


All intervals in the example above are either “perfect” or “major.”

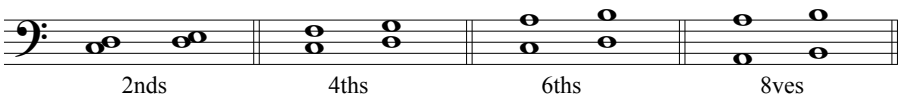
5.1.1 Numeric Size of Interval

There are two elements to naming intervals: the quality and the number (for example, “major sixth,” abbreviated as “M6”). Let us first focus on the numeric size of intervals.

Odd-numbered intervals will always be a line to a line or a space to a space.



Even-numbered intervals will always be a space to a line or a line to a space.

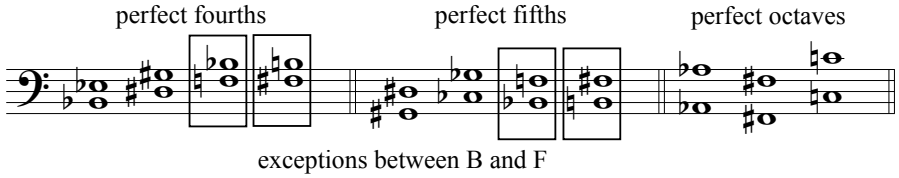


5.1.2 Interval Quality: Perfect versus Major/Minor

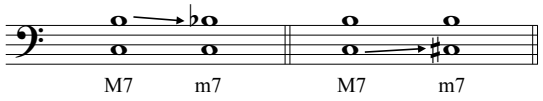
Intervals such as the unison, fourth, fifth, and octave can be classified as "**perfect**" but never "major" or "minor". Conversely, the intervals of the second, third, sixth, and seventh can be **major** or minor but never perfect in quality.

Perfect Intervals:	Unison, 4th, 5th, 8ve
Major or Minor Intervals:	2nd, 3rd, 6th, 7th

Perfect intervals are always natural to natural, sharp to sharp, and flat to flat except for the fourths and fifths between B and F, which involve B to F$^{\sharp}$ and B$^{\flat}$ to F.



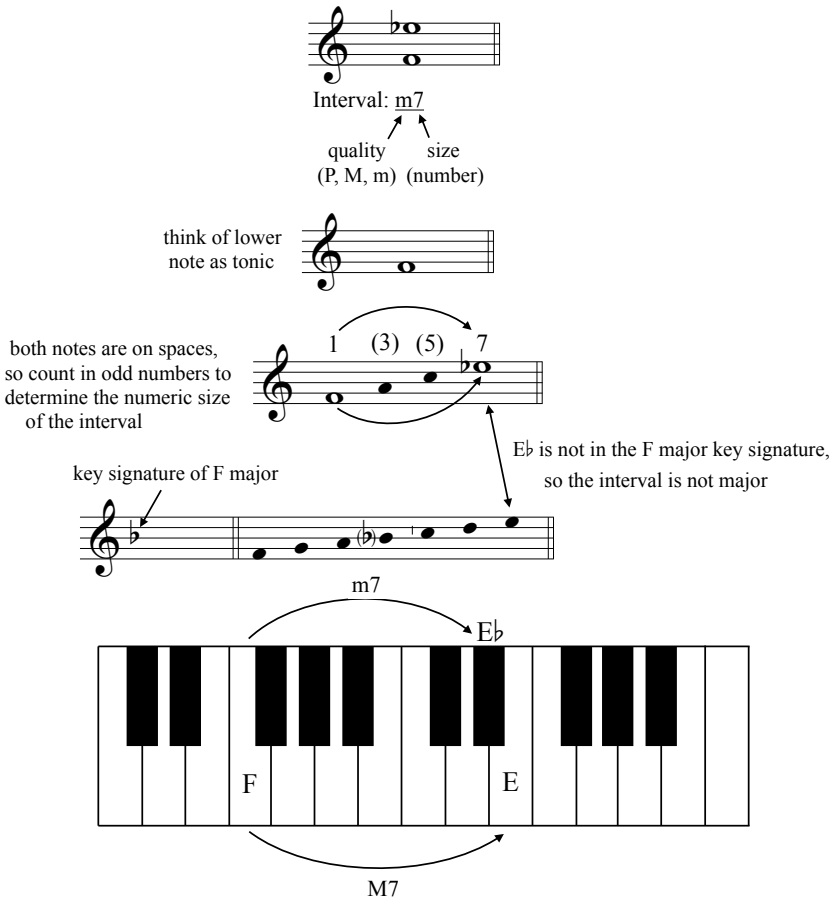
Minor intervals are one half step smaller than major intervals.



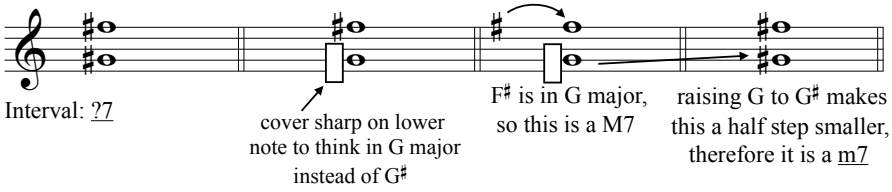
5.2 How to Identify Perfect, Major, and Minor Intervals

Here are two methods for identifying intervals.

The first method involves thinking of the lower note of an interval as the tonic (the first note of the scale). Remember that all the notes above the tonic in a major scale are perfect or major. Determine if the upper note is in the major scale. If it is not, determine if the interval is a half step smaller than a major interval, in which case it is a minor interval.



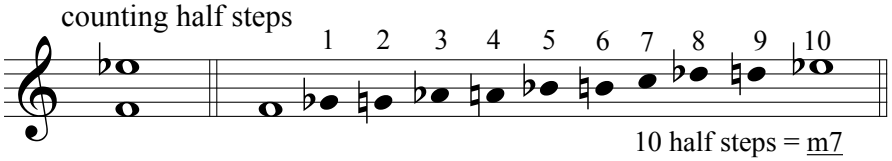
If the lower note of an interval has a sharp or flat on it, cover up the accidental, determine the interval, then factor the accidental back in.



The second method is to memorize how many half steps there are in each interval. To determine the size of an interval, count the number of half steps between the two notes then refer to your memory.

Number of half steps	Name of interval	Number of half steps	Name of interval
1	m2	7	P5
2	M2	8	m6
3	m3	9	M6
4	M3	10	m7
5	P4	11	M7
6	Tritone∗	12	P8

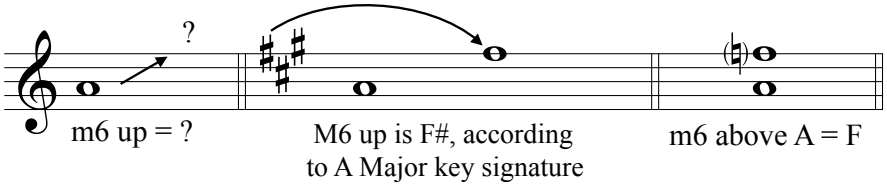
∗ A "tritone" is a generic name for an augmented fourth (+4) or diminished fifth (°5). These two intervals are enharmonic. Augmented and Diminished Intervals are discussed later in this chapter.



5.3 How to Write Perfect, Major, and Minor Intervals

To write an interval *above* a given note, use the two methods given below.

If you are asked to write a minor sixth above the note A, start with the A major scale and key signature. In A major, there is an F♯, which is a major sixth above the note A. Therefore, F♮ is a minor sixth above A.

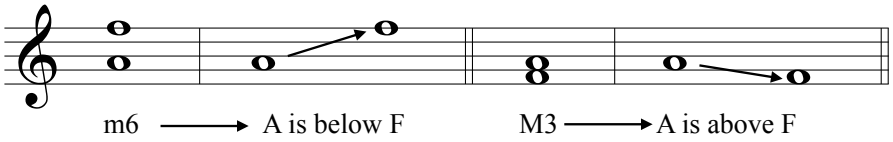


Alternatively, you can simply count the number of half steps. If you know there are 8 half steps in a minor sixth, you can count from A up to F.

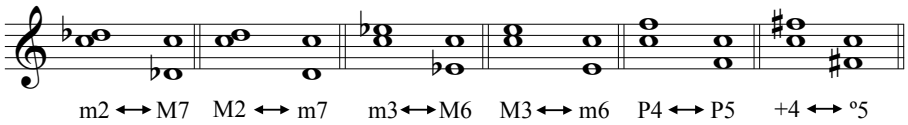
Writing small intervals up to a major third *below* a given note is straightforward using a combination of whole and half steps. However, to write larger intervals below a given note, it is sometimes helpful to invert the interval first (Inversion of Intervals Explained is discussed in the next section).

5.4 Inversion of Intervals Explained

There are only two notes in an interval, one lower and one higher. To invert an interval, change the position of the notes so the note that was lower is now higher.

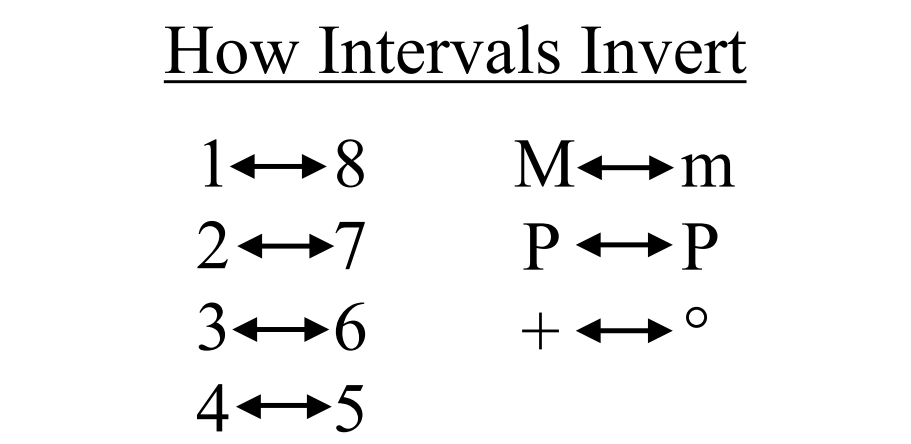


In the above example, a m6 inverts to a M3. This is true for all notes a M3 (or m6) away from each other. Below are examples of how intervals invert.

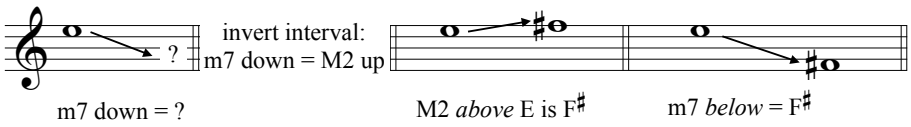


Note that the symbol ° represents "diminished" (one half step smaller than perfect or minor) and the symbol + represents "augmented" (one half step larger than perfect or major).

Below is a chart of how intervals invert.



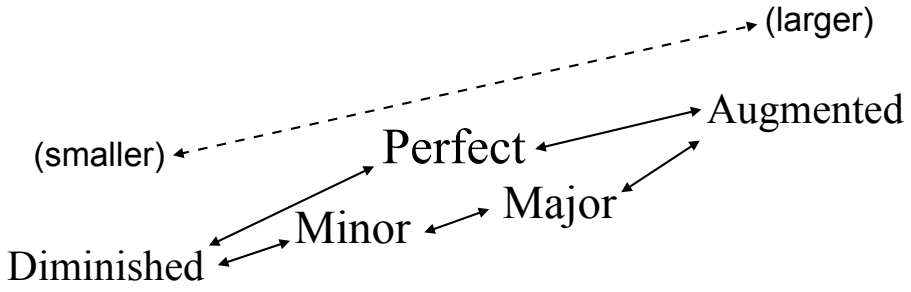
To write a small interval *below* a given note, you should be able to combine whole steps and half steps up to the interval of a perfect fourth (two whole steps plus one half step). To write a larger interval below a given note, invert the interval size, determine the note *above*, then write it *below* the given note.



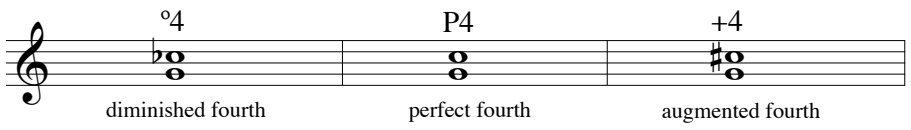
5.5 Augmented and Diminished Intervals

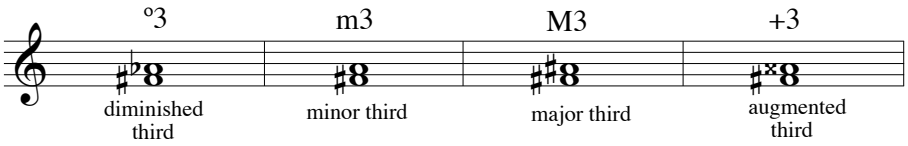
Augmented intervals are one half step *larger* than perfect or major intervals and **diminished intervals** are one half step *smaller* than perfect or minor intervals.

Remember that perfect intervals (unisons, fourths, fifths, and octaves) can never be major or minor, and major and minor intervals (seconds, thirds, sixths, and sevenths) can never be perfect in quality. However, any size of interval can be augmented or diminished.



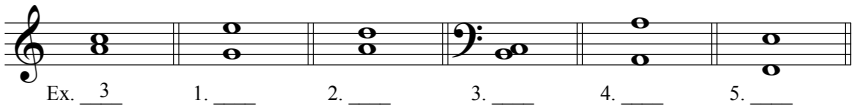
Here are musical examples illustrating the continuum of interval quality.



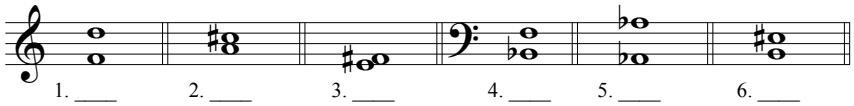


5.6 Practice Exercises

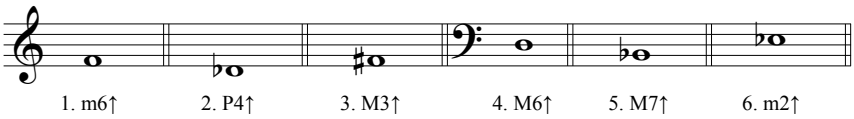
1. Specify only the number, not the quality, for each example.



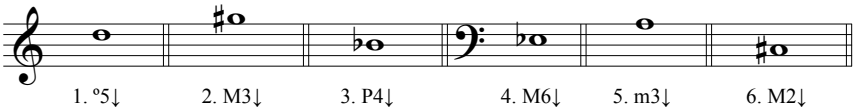
2. Identify the interval quality and size for each example.



3. Write the following intervals *above* the given note.



4. Write the following intervals *below* the given note.



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PDF versions of the textbook, homework exercises, and practice exercises can be found at musictheory.pugetsound.edu

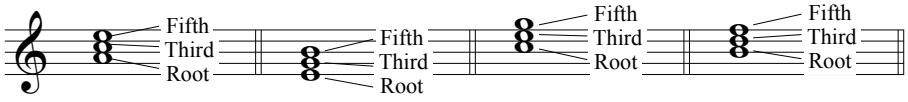
Chapter 6

Triads

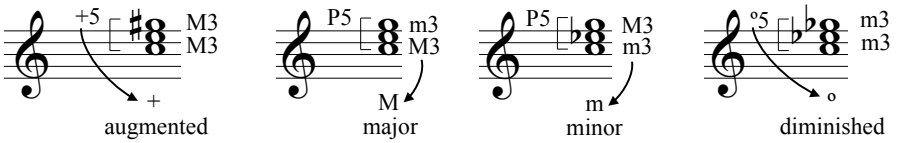
6.1 Introduction to Triads

A **triad** consists of three notes stacked in consecutive thirds. A triad is also called a **chord** as well as a **harmony**. (Harmony also refers to chord progressions.)

The lowest note of a triad when it is stacked in thirds is called the **root**. The middle note is the third and the highest note of the triad is the fifth. (We will discuss inversions of triads later.)



There are four qualities of triads—**augmented**, **major**, **minor**, and **diminished**.

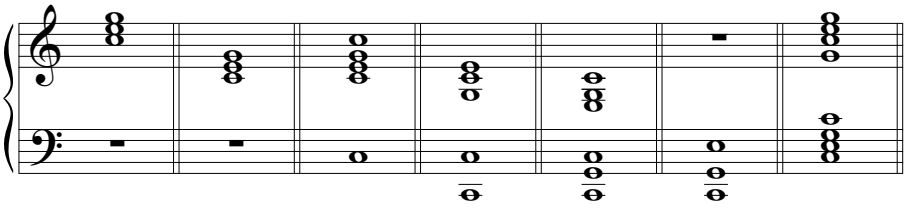


Major and minor triads are common, diminished triads are less common, and augmented triads are rare.

6.2 Lead-Sheet Symbols

Lead-sheet symbols (also known as "lead-sheet notation" and "lead-sheet chord symbols") are often used as shorthand for chords in popular music and jazz. These symbols allow a guitarist or pianist to choose how to "voice" the chords, i.e., how they want to arrange the notes.

C major triad in different voicings—all chords below contain only C, E, and G



Lead-sheet symbols for triads communicate the *root* and *quality* of a chord.

Lead-sheet Symbol	*Chord Quality*	*Notes in the Chord*
F	major	F–A–C
Gm	minor	G–B$^{\flat}$–D
D°	diminished	D–F–A$^{\flat}$
C+	augmented	C–E–G$^{\sharp}$

Here is a musical example with lead-sheet symbols and guitar tablature.

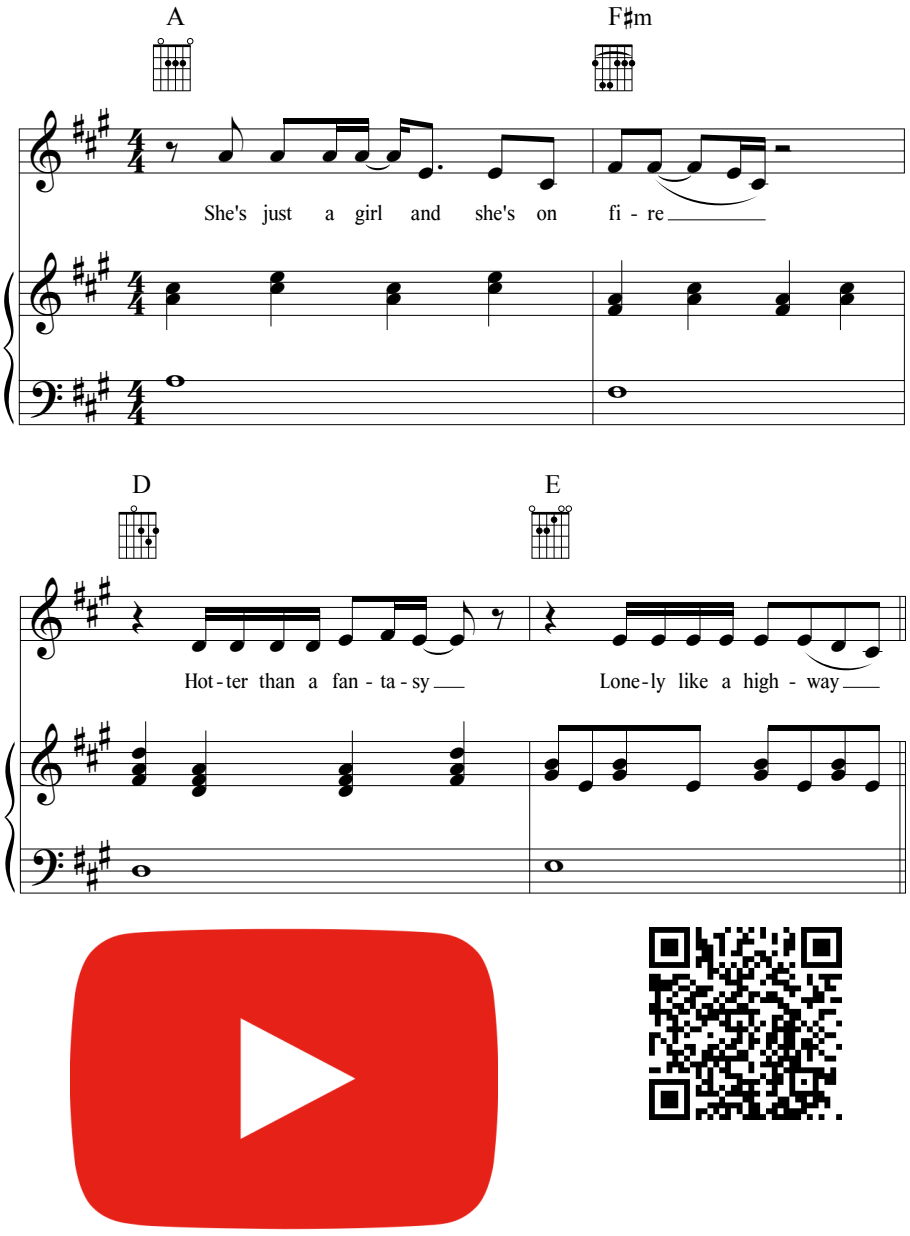


Figure 6.2.1 Alicia Keys, Salaam Remi, Jeff Bhasker, Billy Squier, "Girl on Fire" (2012)

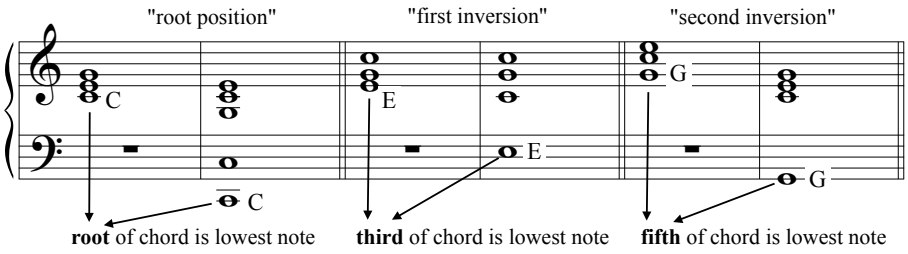
As you can see in the example above, major triads are represented by an uppercase letter (A, E, and D) while minor triads are represented with the root in uppercase followed by a lowercase "m" (e.g., F$^{\sharp}$m). Diminished triads

are represented by including the diminished symbol (°) after the chord root (e.g., C°) while augmented triads are represented by including the augmented symbol after the root (C+).

6.3 Inverted Triads

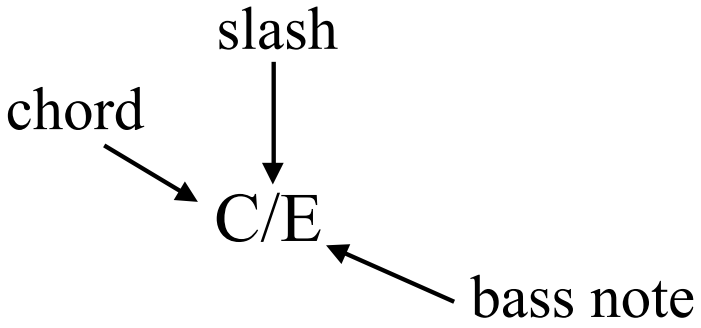
An **inverted triad** does not have the root as the lowest note. It is important to distinguish between *root* and *bass*. The root of a chord is the lowest note *when the notes are stacked in thirds*. The *bass* is the lowest note, which might be the root, third, or fifth.

A triad is in "**root position**" when the root is the lowest note, "**first inversion**" when the third of the chord is the lowest note, and "**second inversion**" when the fifth of the chord is the lowest note.



6.3.1 "Slash" Chords

In lead-sheet notation, an inverted chord has the triad before the slash (/) and the bass note after it. " C/E " means a C triad with an E as the lowest note. Therefore, a **slash chord** has a bass note that is not the root of the chord. In fact, it is possible to have slash chords where the bass note is not one of the chord tones (e.g., $C/F^{\sharp}$).



Remember, in a slash chord, *the first letter you see represents the root of the chord*. The letter *after* the slash is the *lowest* note (the bass).

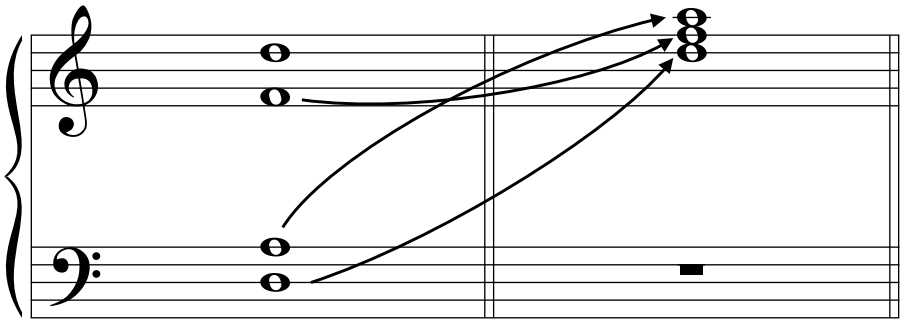
Lead-sheet Symbol	*Root of Chord*	*Notes in the Chord*	*Bass Note (Lowest Note)*
F/A	F	F–A–C	A
Dm/A	D	D–F–A	A
$G^{\circ}/D^{\flat}$	G	G–$B^{\flat}$–$D^{\flat}$	$D^{\flat}$
$C+/G^{\sharp}$	C	C–E–$G^{\sharp}$	$G^{\sharp}$

6.4 Analyzing Chords

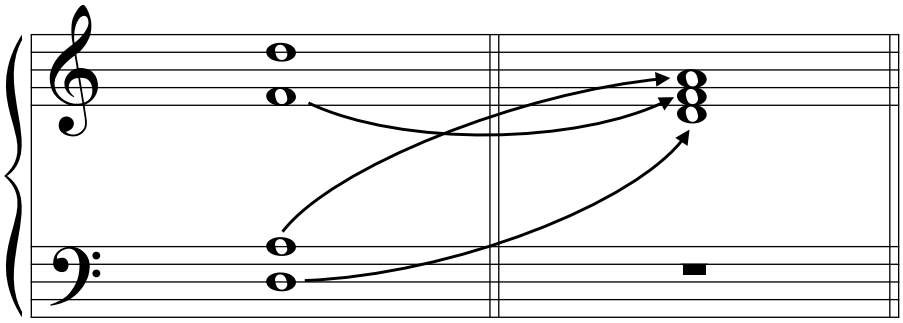
When a three-note chord is represented by four or more notes (some of which are duplicates of the original three notes) and spread out across a grand staff, we can arrive at a lead-sheet symbol by answering three questions:

1. What is the root of the chord?
2. What is the quality of the chord (i.e., is the chord major, minor, diminished, or augmented)?
3. What is the bass note (i.e., is the chord inverted)?

To determine the root of the chord, write all the notes only on the lines of the staff in treble clef (you may need to use ledger lines).

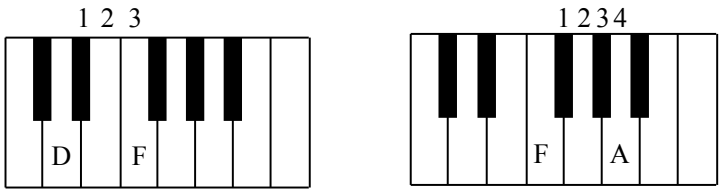


You could also choose to write all the notes only on the spaces in a staff.



The bottom note is the root when the chord is stacked as a triad. In this case, the root is D.

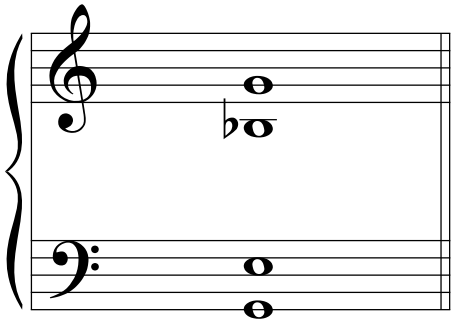
Next, determine the quality of the triad (major, minor, diminished, or augmented) by analyzing if there is a M3 or m3 from the root to the 3rd, and if there is a M3 or m3 from the 3rd to 5th.



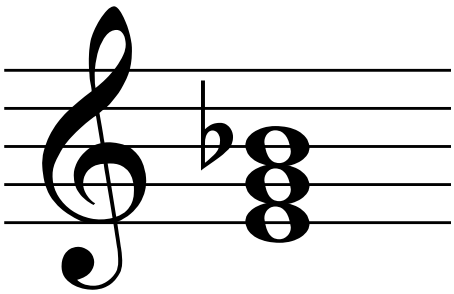
Since there is a m3 (3 half steps) from D to F and a M3 (4 half steps) from F to A, the triad is minor.

Finally, determine if the chord is inverted by checking to see if a note other than the root is the lowest note. Since the bass note (lowest note) is the root D, the chord is not inverted. The chord is in root position, so the lead-sheet symbol is Dm.

Now, try the process again.

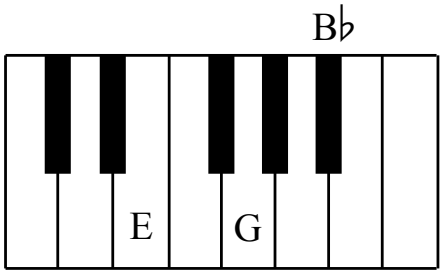


On scratch paper, stack the notes only on lines in the treble clef to determine the root.



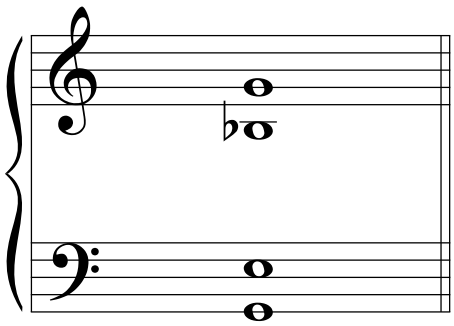
The root is E.

Analyze the quality of the triad by measuring from E to G and from G to B♭.



It is an E diminished triad (E°).

Finally, determine if the chord is inverted. Is the root (E) the lowest note?

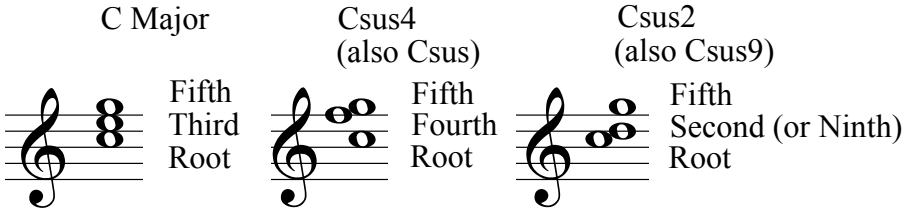


Since the lowest note is G, the chord is inverted. Our lead-sheet symbol is E°/G, which means we have an E° chord with a G in the bass.

6.5 Simple "Sus" Chords

Common in popular music are "sus" chords, with "sus" being a shortening of "suspended," a term we will study in the chapter on non-chord tones.

The two basic sus chords are the sus4 and sus2 chords. In the **sus4** chord (also labeled simply as "sus"), a perfect 4th replaces the 3rd of the chord. In the **sus2** chord (sometimes called "sus9"), a major 2nd replaces the 3rd of the chord. Both of these sus chords have a perfect 5th from the root to the fifth.



Here is a musical example with a sus4 chord.

Figure 6.5.1 Peter Cetera and David Foster, "Hard to Say I'm Sorry"

Here is a musical example with a sus2 chord.

Figure 6.5.2 Sara Bareilles, "Love Song"

We will not invert sus chords in this text. In a later chapter, there is a section on more sophisticated sus chords like $C^9\text{sus}$ and $C^7\text{sus}\,(\flat 9)$.

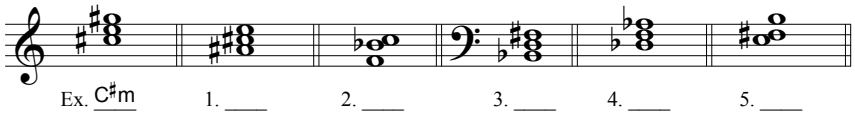
6.6 Summary

Triad construction is summarized in the following table.

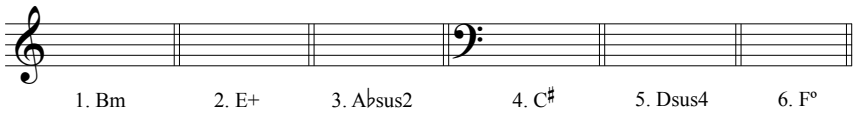
	Lower Interval	Upper Interval
Augmented:	M3 (4 half steps)	M3 (4 half steps)
Major:	M3 (4 half steps)	m3 (3 half steps)
Minor:	m3 (3 half steps)	M3 (4 half steps)
Diminished:	m3 (3 half steps)	m3 (3 half steps)
Sus2:	M2 (2 half steps)	P4 (5 half steps)
Sus4:	P4 (5 half steps)	M2 (2 half steps)

6.7 Practice Exercises

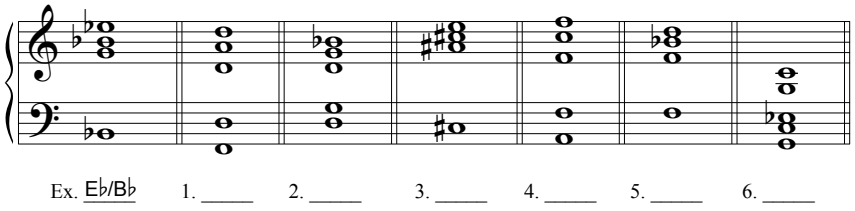
1. Analyze the triad types (M, m, +, °) using lead-sheet symbols. Sus2 and sus4 chords are also included.



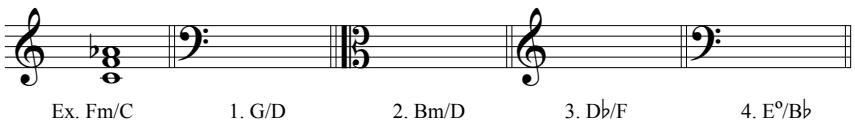
2. Write the specified triads and sus chords.



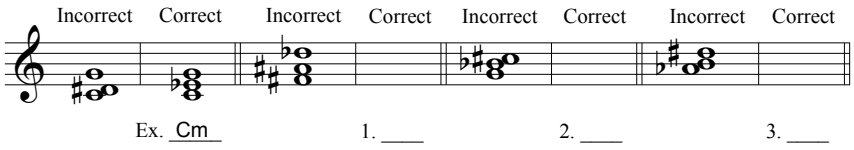
3. Analyze the following inverted triads using slash notation.



4. Write the specified inverted triads.



5. Correct the misspelled triads. Label your corrected spelling with lead-sheet notation. All of the examples are in root position (the lowest note is the root).



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Chapter 7

Roman Numerals and Cadences

7.1 Roman Numeral Chord Symbols

Music is full of patterns that are similar from one piece to the next. As we saw with minor scales, we were able to use scale degree numbers to show the different patterns for harmonic, melodic, and natural minor, despite the fact that there are 15 minor key signatures. Using numbers instead of note names helps us see these patterns. Thinking of music in terms of numbers is also helpful with **transposition**, which means moving melodies and/or chord progressions from one key to another. Thinking of music in terms of numbers also helps us to analyze it and to spot similar patterns between many different pieces in different keys.

We will use Roman numerals to represent chords within a specified key. The Roman numeral "I" represents a triad built on $\hat{1}$, or the 1st note of the scale. Uppercase Roman numerals represent major triads and lowercase Roman numerals (e.g., "i") represent minor triads. Uppercase Roman numerals with a "+" are augmented (e.g., "III+"), and lowercase Roman numerals with a "°" are diminished (e.g., "vii°"). (There is also the Nashville Number System, which uses Arabic numbers for chords instead of Roman numerals.)

Key	*Lead-Sheet*	*Root*	*Scale Degree of Root*	*Roman Numeral*	*Notes in Chord*
G	Bm	B	$\hat{3}$	iii	B–D–F$^{\sharp}$
f	G°	G	$\hat{2}$	ii°	G–B$^{\flat}$–D$^{\flat}$
c	E$^{\flat}$	E$^{\flat}$	$\hat{3}$	III	E$^{\flat}$–G–B$^{\flat}$

For inversion of Roman numerals, we will use a modified "slash chord" notation until we study Figured Bass. For now, we will write "I/3rd" if the 3rd of the I chord is the bass note, for example.

C: I/3rd

the 3rd of the I chord (C-**E**-G) is in the bass

G: ii/5th

the 5th of the ii chord (A-C-**E**) is in the bass

The following table offers more examples.

Key	*Roman Num.*	*Root*	*Scale Deg. of Root*	*Notes in Chord*	*Bass Note*
g	V/3rd	D	$\hat{5}$	D–F$^{\sharp}$–A	F$^{\sharp}$
a	iv/5th	D	$\hat{4}$	D–F–A	A
D	vii°/3rd	C$^{\sharp}$	$\hat{7}$	C$^{\sharp}$–E–G	E

7.2 Diatonic Chords in Major

Observe the pattern of diatonic chords in major represented by Roman numerals. (**Diatonic** means notes *within* a key signature and can be contrasted with the term "chromatic.") One sees the pattern M-m-m-M-M-m-° in triad quality.

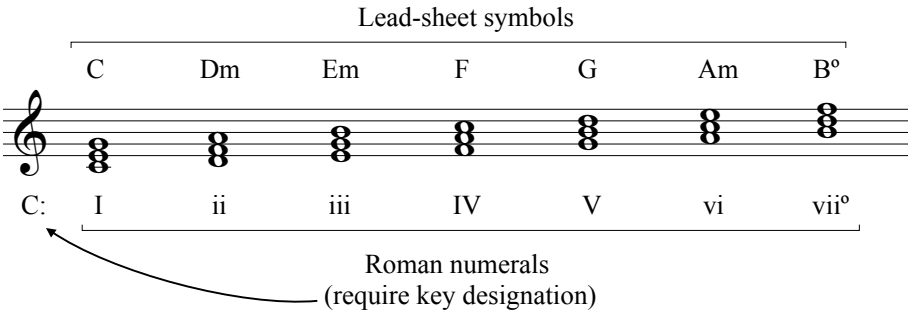

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Figure 7.2.1

7.3 Diatonic Chords in Minor

Because there are three versions of the minor scale, there are more than seven diatonic chords in minor. The sixth and seventh scale degrees affect all of the triads except the tonic, making 13 possible diatonic triads in minor.

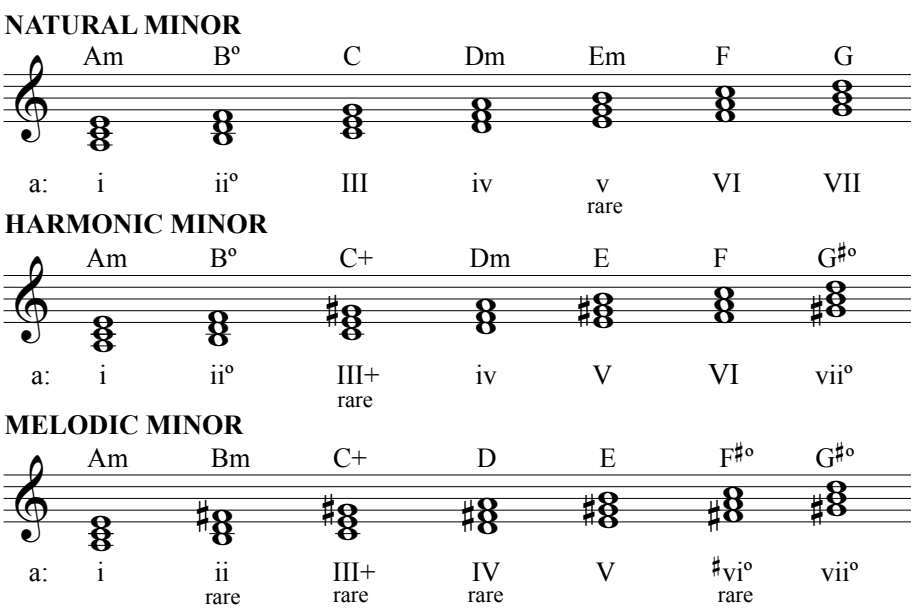

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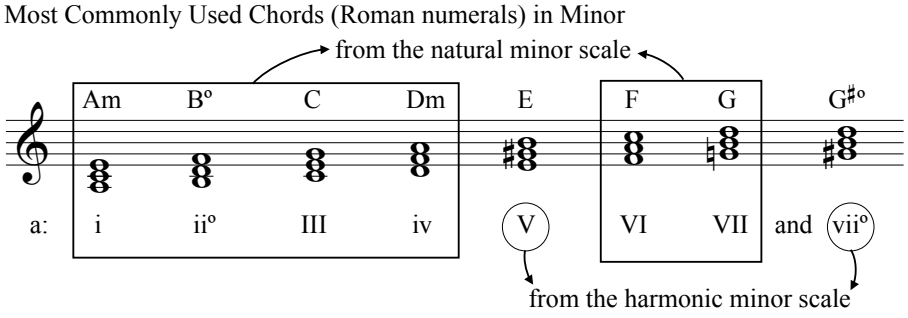
Figure 7.3.1

However, when one analyzes a large amount of tonal music, one finds the following Roman numerals are most commonly used in minor.



Notice that both VII (the "subtonic triad") and vii° (the "leading-tone triad") are included.

Definition 7.3.2 The **subtonic triad** (VII) is built on the lowered $\hat{7}$ that occurs in *natural* minor and requires no accidentals in minor keys. ◊

The subtonic triad regularly occurs in circle of fifth progressions in minor (see Section 9.1) and in rock and pop music (see Section 9.6). The leading-tone triad (vii°) is built on raised $\hat{7}$ and is usually either a passing harmony or has dominant function (see Section 9.4).

7.4 Cadences

We've been studying harmony—triads and chords. A **cadence** is a harmonic arrival point, a harmonic moment of stasis. A cadence can be compared to a comma or period in written language—the ear gets a moment to process a short passage of music, then the music continues. We will differentiate between four basic cadences now, adding more specificity in a later chapter.

1. **Authentic Cadence** (AC): a phrase ending with the chords V–I
2. **Plagal Cadence** (PC): a phrase ending with the chords IV–I
3. **Deceptive Cadence** (DC): a phrase ending with the chords V–vi
4. **Half Cadence** (HC): a phrase ending on the V chord

7.4.1 Examples of Authentic Cadences

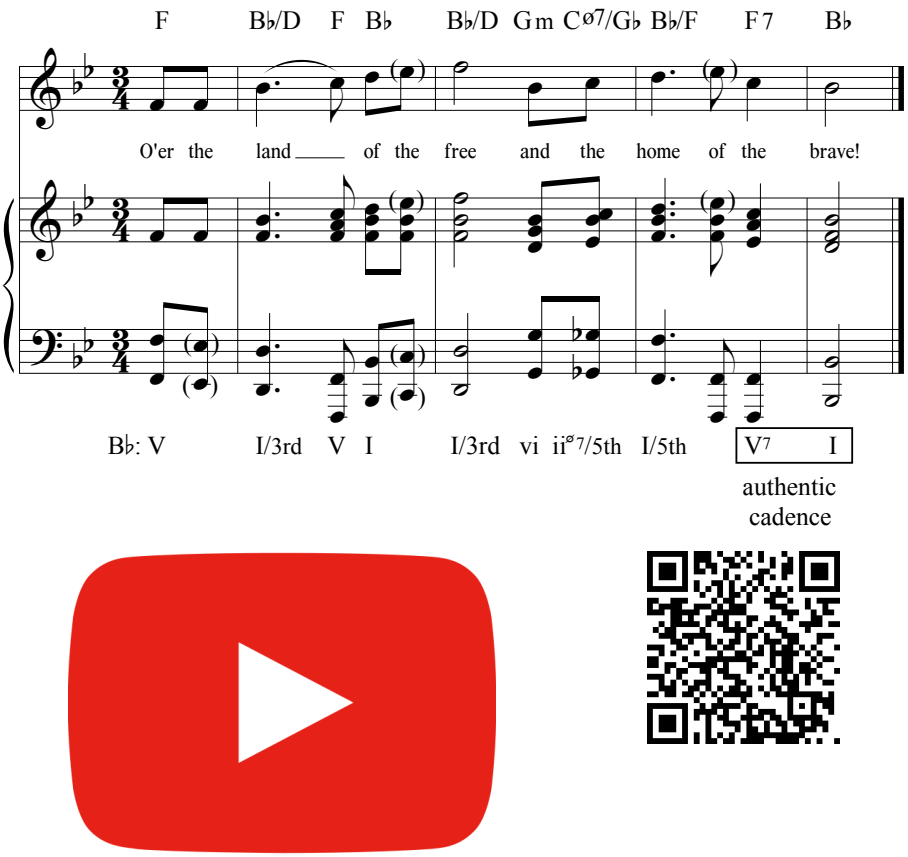


Figure 7.4.1 Francis Scott Key and John Stafford Smith, "Star-Spangled Banner"

In the example above, the notes surrounded by parentheses are non-chord tones, which will be studied later. Also, there are seventh chords in this example, which we will study in the next chapter.

Here is another example ending with an authentic cadence.

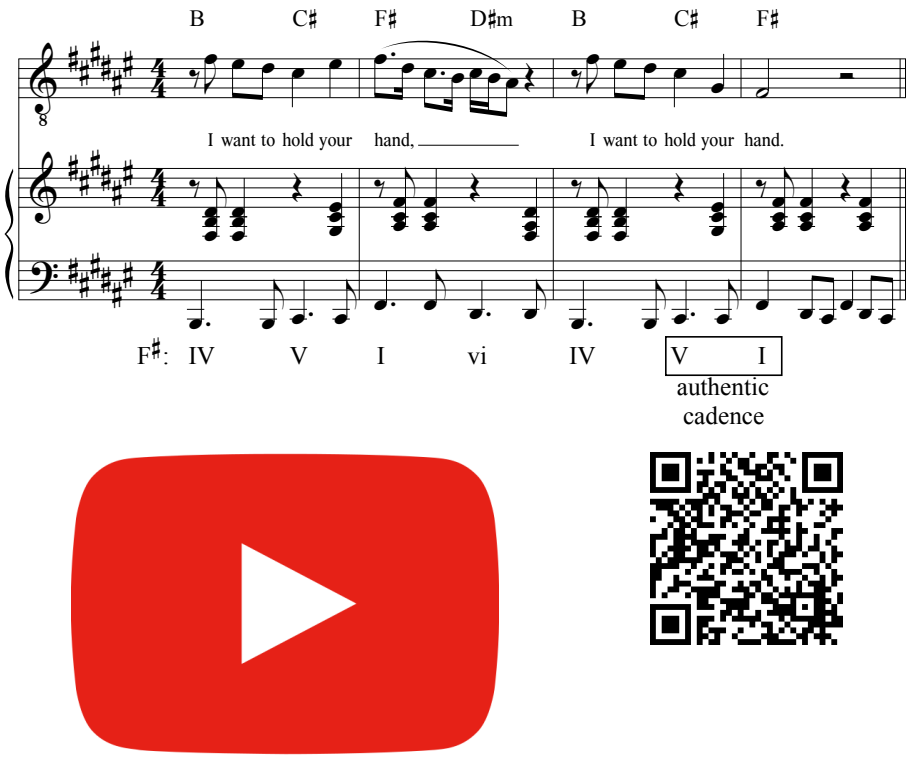


Figure 7.4.2 Lennon-McCartney, "I Want to Hold Your Hand"

7.4.2 Examples of Plagal Cadences

Here are examples with plagal cadences.

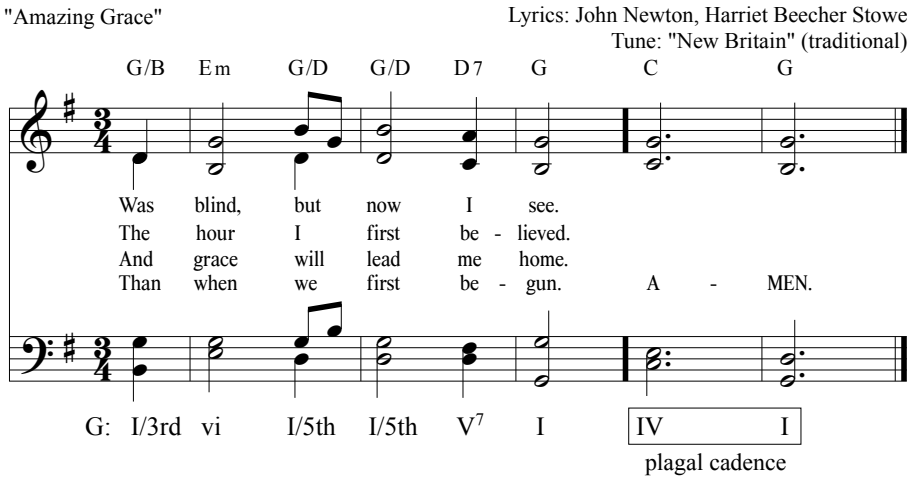


Figure 7.4.3

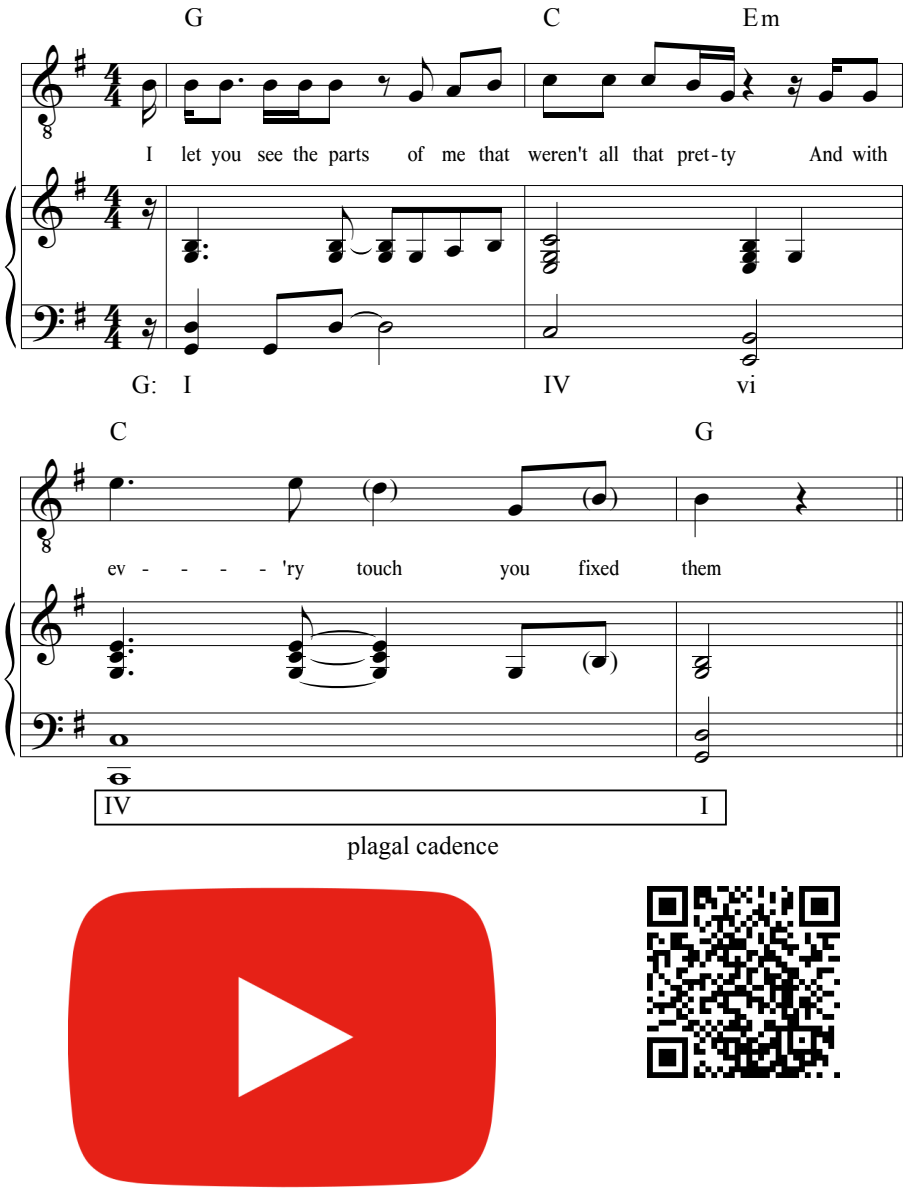


Figure 7.4.4 Pink, Bhasker, and Ruess, "Just Give Me a Reason"

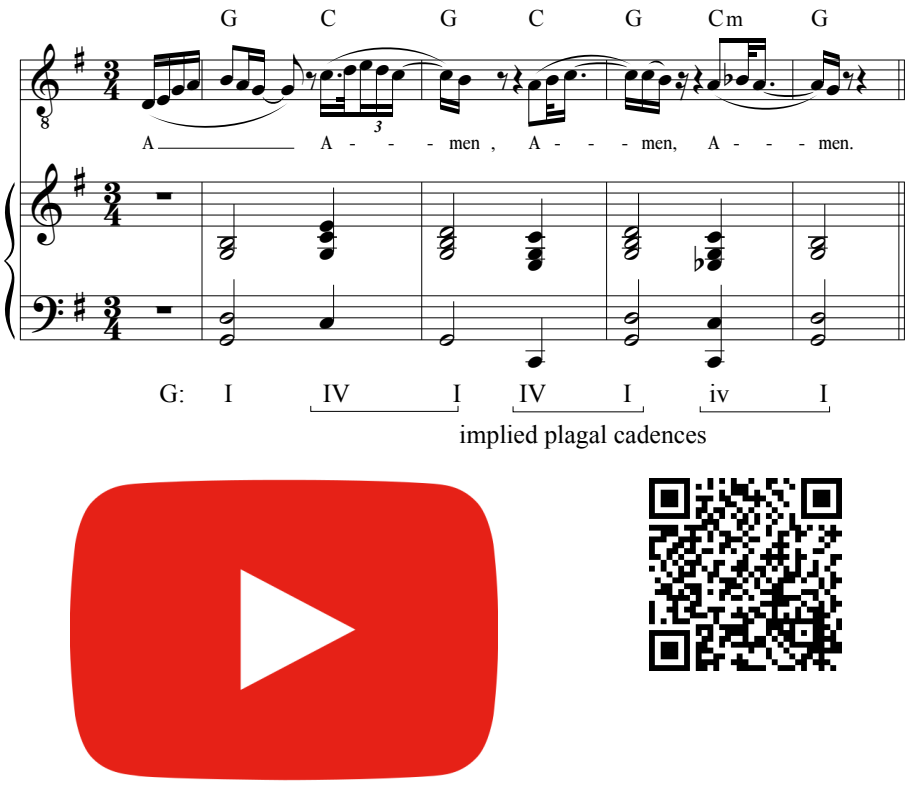


Figure 7.4.5 Hozer-Byrne, "Take Me to Church"

7.4.3 Examples of Deceptive Cadences

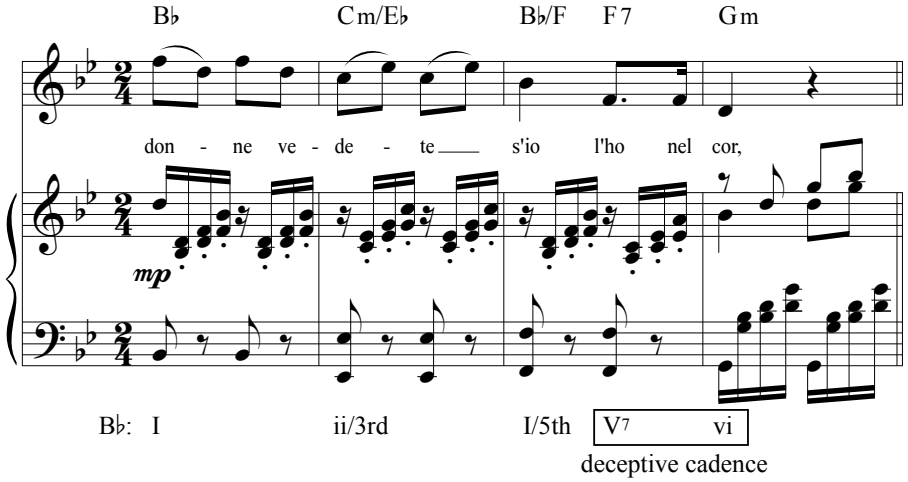


Figure 7.4.6 Mozart, *The Marriage of Figaro*, "Voi che sapete"

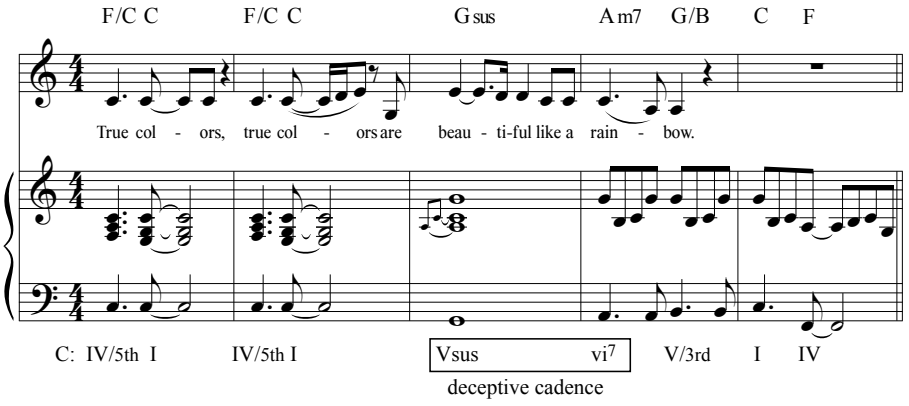


Figure 7.4.7 Kelly and Steinberg, "True Colors"

The following example, from the prelude to Act I of Richard Wagner's opera *Tristan und Isolde*, is arguably one of the most famous deceptive cadences in the history of classical music.

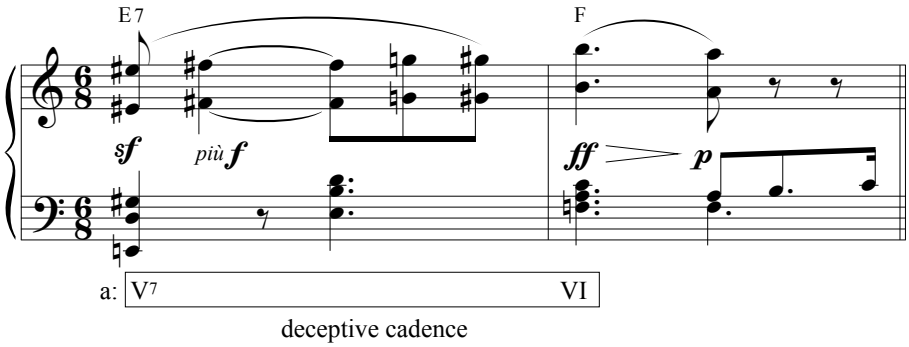


Figure 7.4.8 Wagner, *Tristan und Isolde*, Prelude to Act I

A deceptive cadence means V did not go to I. This means that "V to not-I" is technically a more correct description for a deceptive cadence than V-vi, which is the most common realization of "V to not-I."

In the example below, V goes to IV/3rd.

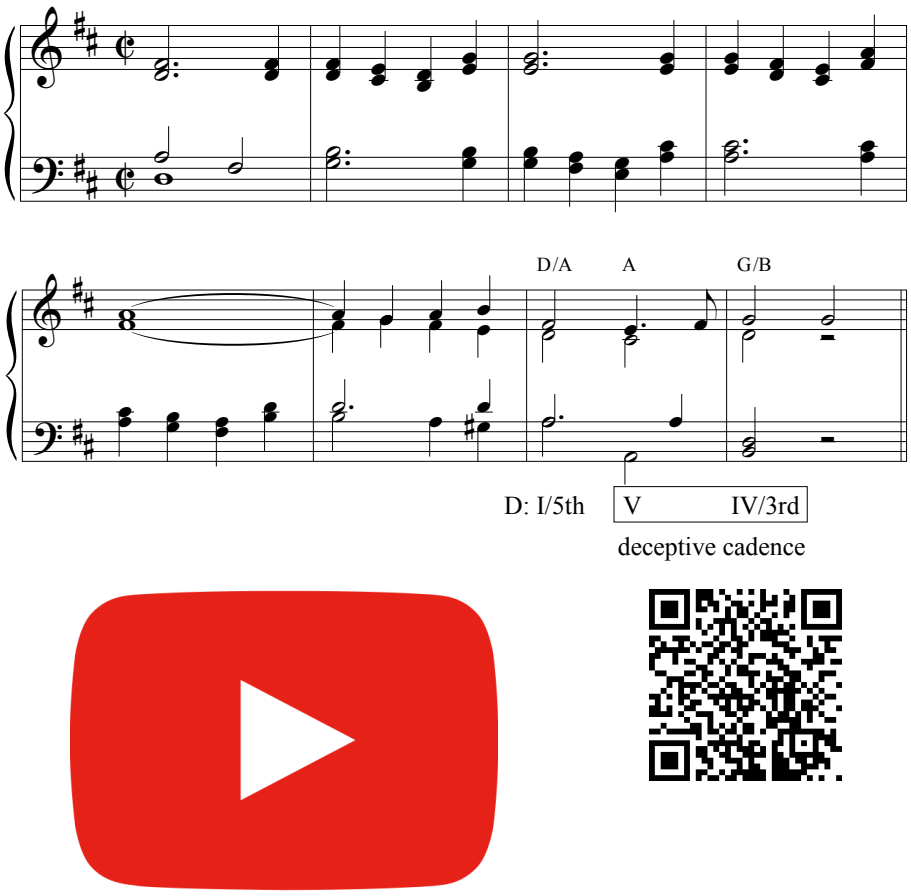


Figure 7.4.9 Mozart, *Ave Verum Corpus*, K. 618

7.4.4 Examples of Half Cadences

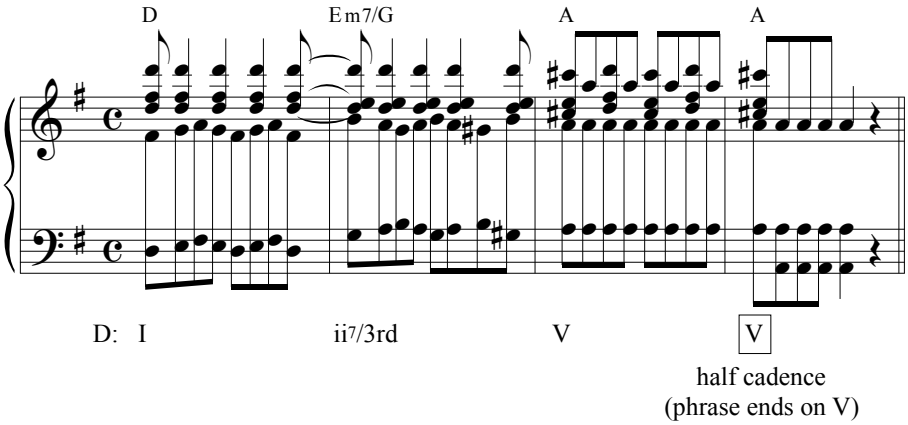


Figure 7.4.10 Mozart, *Eine kleine Nachtmusik*, K. 525, I.

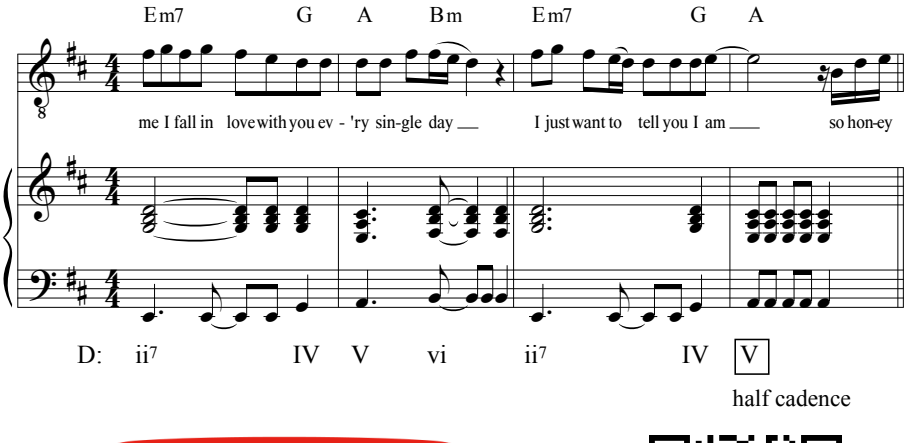


Figure 7.4.11 Sheeran and Wadge, "Thinking Out Loud"

You may encounter chords with no thirds in rock and pop music. If you encounter a chord that has only a root and fifth, label it with a "5" after the

root in lead sheet labeling (e.g., B^5, as in the next example).

Additionally, you may encounter incomplete chords.

Definition 7.4.12 Incomplete chords are chords containing only the root and third but no fifth. ◊

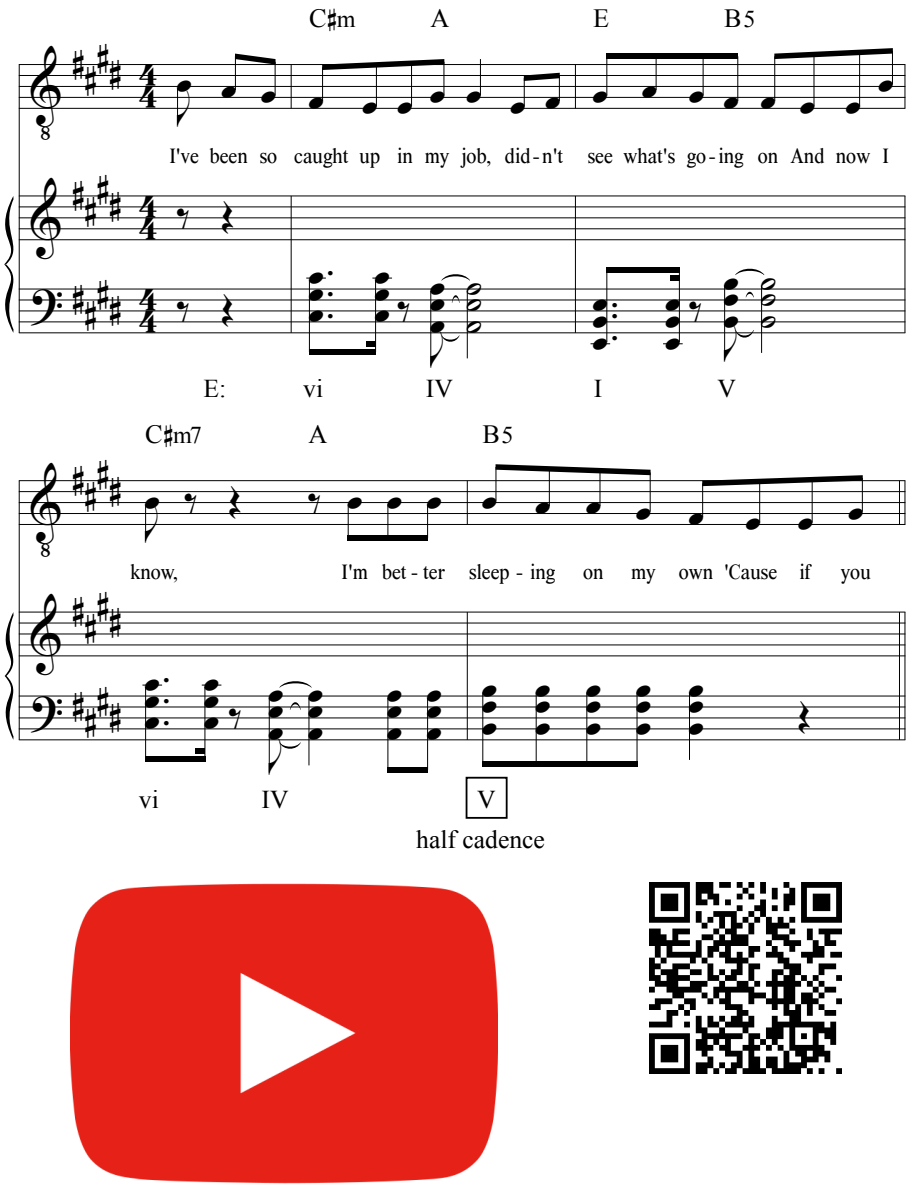
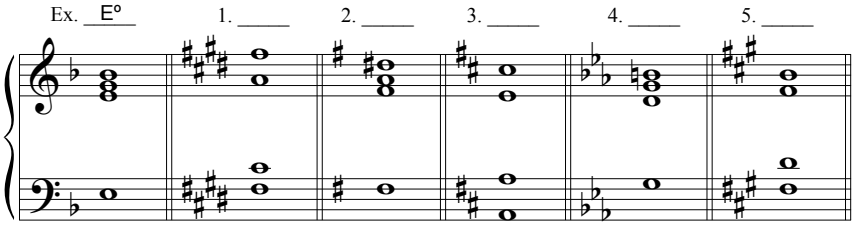


Figure 7.4.13 Bieber, Blanco, and Sheeran, "Love Yourself"

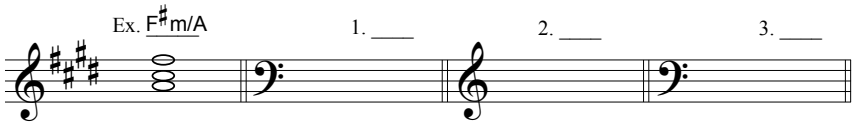
7.5 Practice Exercises

1. Label the following chords with lead sheet symbols (above) and Roman numerals (below).



Ex. d: ii° 1. E: _____ 2. e: _____ 3. b: _____ 4. c: _____ 5. A: _____

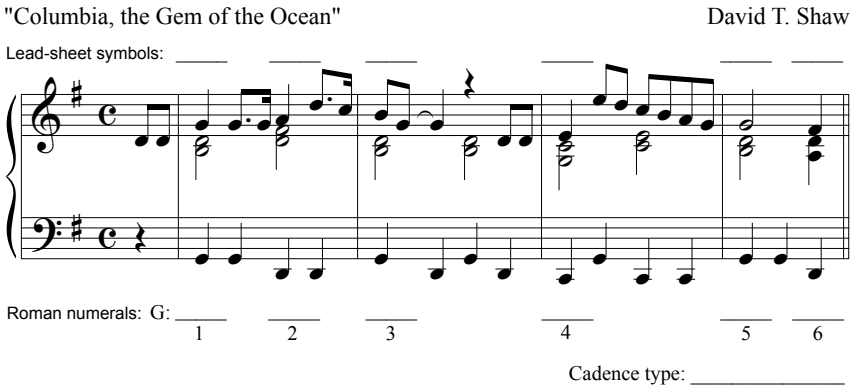
2. Given the Roman numeral and key, write the key signature, notate the triad, and label the chord with a lead-sheet symbol (above).



Ex. E: ii/3rd 1. f: V 2. D: IV/5th 3. b♭:vii°

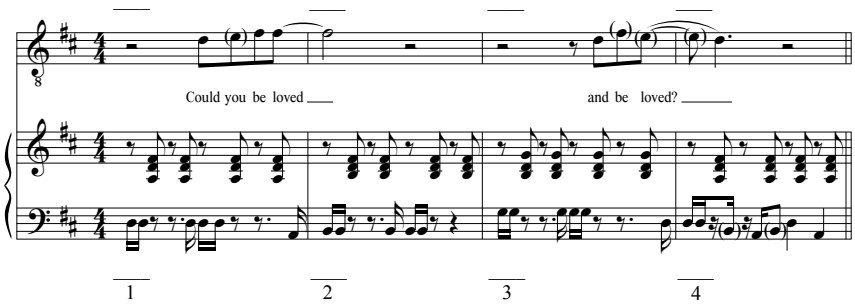
3. Label lead-sheet symbols above and Roman numerals below and analyze the type of cadence that ends the phrase.

Thomas a'Becket, "Columbia, the Gem of the Ocean"



Bob Marley, "Could You Be Loved"

"Could You Be Loved" Bob Marley



Cadence type: _____

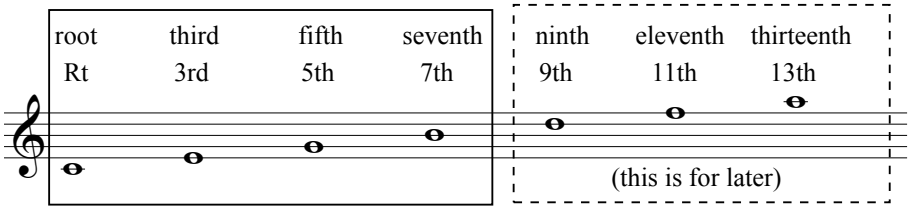
Click here to download the homework.

Chapter 8

Seventh Chords

8.1 Introduction to Seventh Chords

A **seventh chord** adds to a triad another note a third higher than the fifth. Chords, being built in thirds, have members that are odd numbers—third, fifth, seventh, and we will eventually discuss extensions of the ninth, eleventh, and thirteenth. The fifteenth would be the double octave, so chords only extend as high as the thirteenth.



In classical and popular music, there are five types of seventh chords commonly encountered:

- the major seventh chord
- the major-minor seventh chord (also known as a dominant seventh chord)
- the minor seventh chord
- the half-diminished seventh chord
- the fully-diminished seventh chord (often called diminished seventh chord)

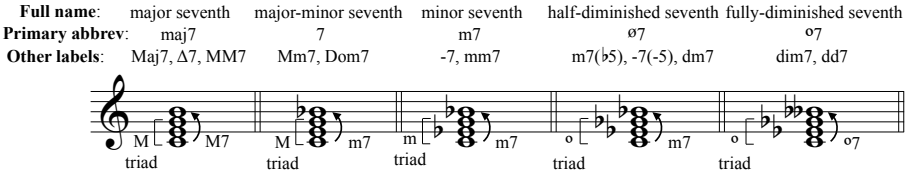
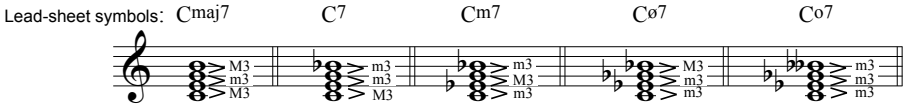


Figure 8.1.1

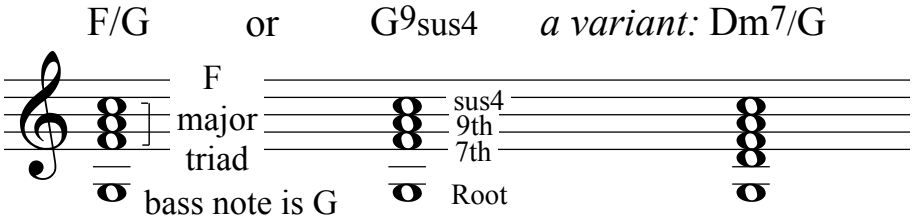
Another way to differentiate between the five types of seventh chords is by learning how the thirds are stacked in each one.



In later chapters we will discuss other seventh chords built on augmented triads and minor triads.

8.2 The IV/5 "sus" chord

An additional four-note chord that sounds like and functions similar to a V^7 chord is the $IV/\hat{5}$ (or F/G in C major) chord. In popular music this chord often is substituted for the V^7 chord



Here is a musical example with the $IV/\hat{5}$ chord in $A^\flat$ major.

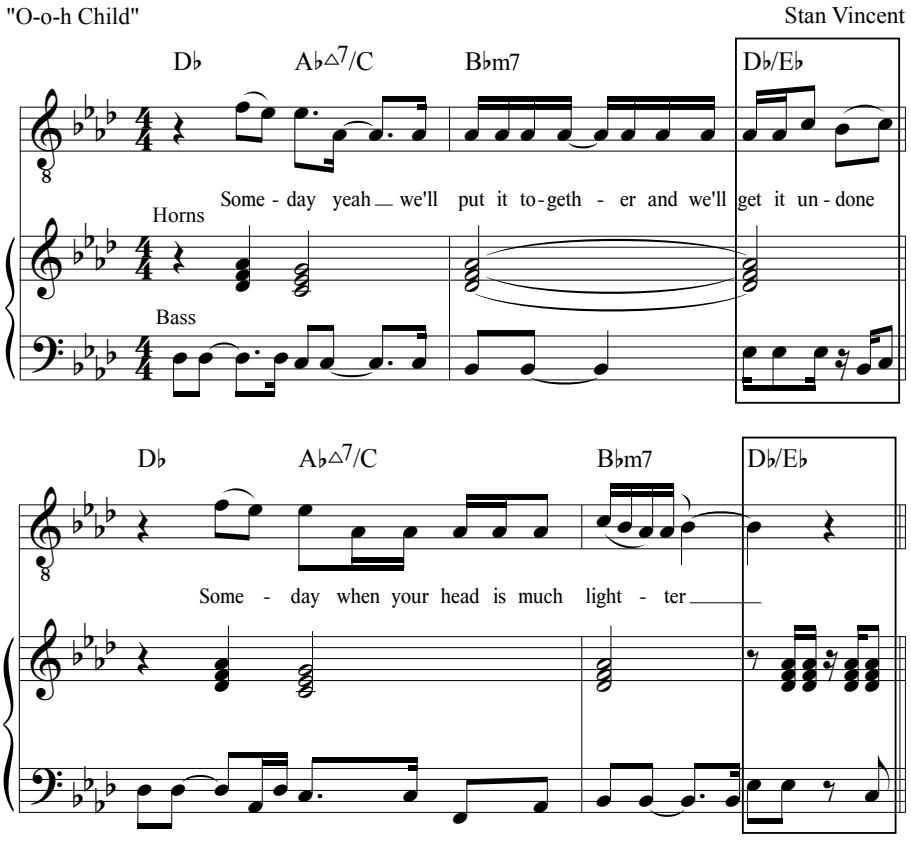


Figure 8.2.1 Stan Vincent, "O-o-h Child"

Another example of this chord is found in the opening to the Beatles' "The Long and Winding Road". In the key E♭ major, the chord is A♭/B♭.

Figure 8.2.2 Beatles, "The Long and Winding Road"

8.3 Roman Numerals of Diatonic Seventh Chords

When notating seventh chords with Roman numerals, there are a few conventions to follow. An uppercase Roman numeral means a major triad and a lowercase Roman numeral means a minor triad. Adding "7" after a Roman numeral means there is a minor seventh between the root and seventh of the chord. Therefore, V^7 means a major triad with a minor seventh between the root and seventh and vi^7 means a minor triad and a minor seventh between the root and seventh. Add "M7" for a major seventh chord (e.g., IM^7). The half-diminished symbol (^{ø7}) means there is a diminished triad with a minor seventh from root to seventh. The diminished symbol ($^{\circ 7}$) on a seventh chord means the triad is diminished and the distance from the root to seventh is a diminished seventh.

Below are the diatonic seventh chords used in major and minor and their Roman numerals.

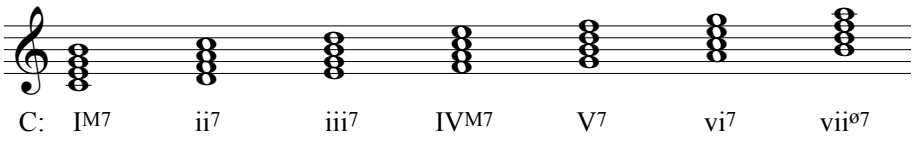


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Figure 8.3.1 Roman numerals for diatonic seventh chords in major

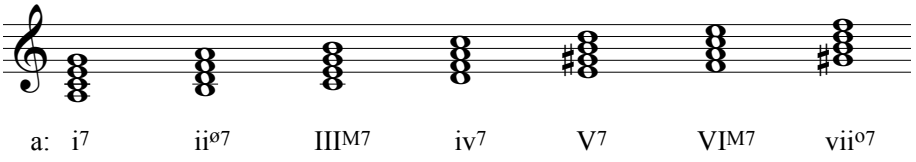

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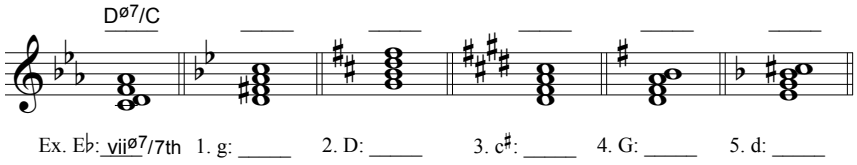
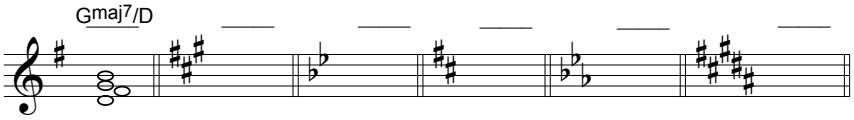
Figure 8.3.2 Roman numerals for diatonic seventh chords in minor

8.4 Practice Exercises

1. Analyze the given chords with lead-sheet symbols above and Roman numerals below.



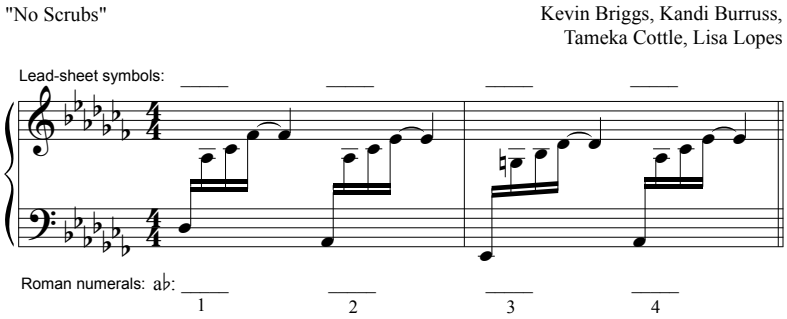
2. Given the Roman numeral, provide the notes of the chord and the lead-sheet symbol above.



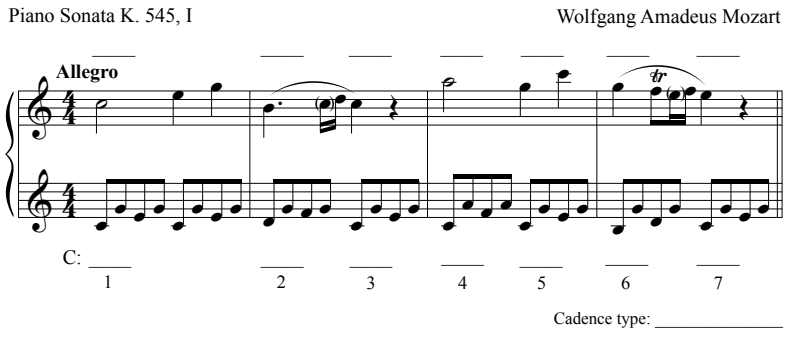
Ex. e: III$^{M7/5th}$ 1. A: ii^{7} 2. g: ii^{ø7} 3. D: vii^{ø7} 4. c: V^{7} 5. B: IV$^{M7/3rd}$

3. Analyze the harmonies in the excerpts with lead-sheet symbols above and Roman numerals below.

(a) "No Scrubs" (1999)



(b) Mozart, Piano Sonata K. 545, I



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Chapter 9

Harmonic Progression and Harmonic Function

In this chapter we will look at common harmonic progressions and examine the principle of harmonic function that underlies progressions.

9.1 The Circle of Fifths Progression

The circle of fifths progression (I–IV–vii°–iii–vi–ii–V–I) was a stalwart of the Baroque era in music. You will find many examples of this progression in the music of Bach, Handel, and Vivaldi, especially in minor (i–iv–VII–III–VI–ii°–V–i) with the subtonic VII (see Definition 7.3.2.

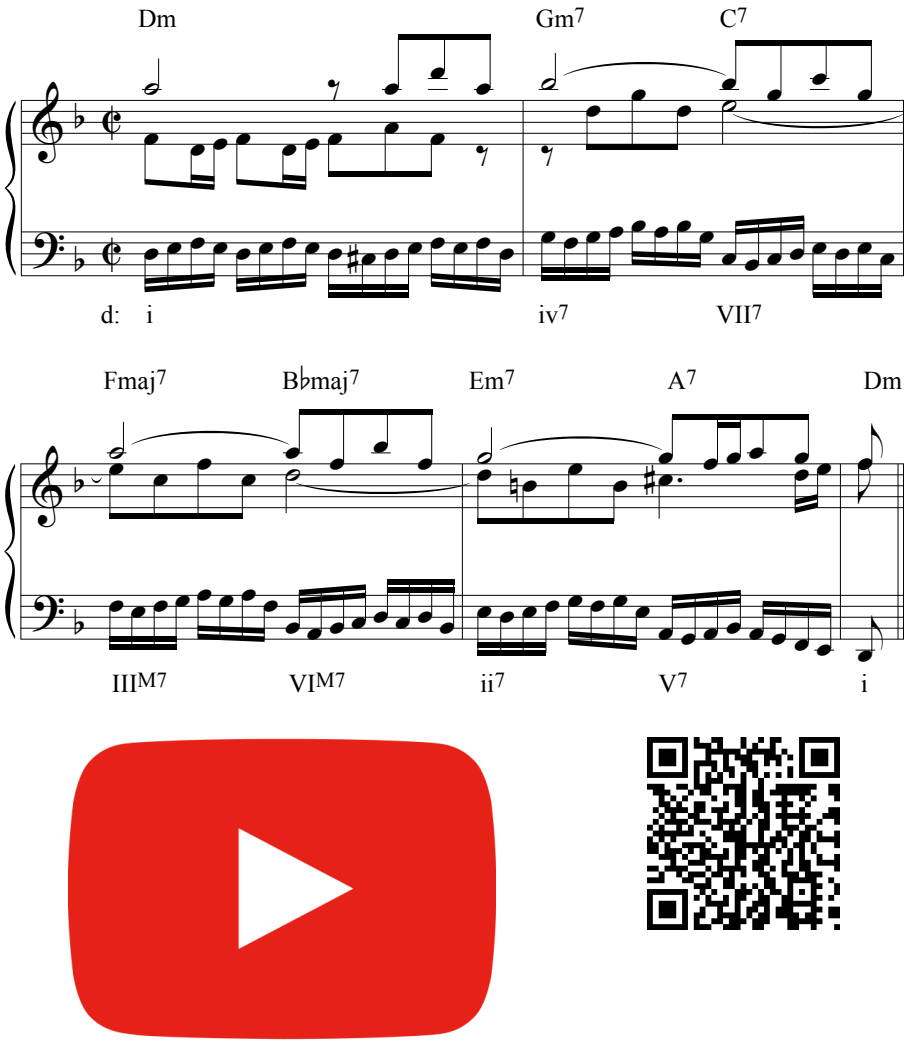


Figure 9.1.1 J.S. Bach, Brandenburg Concerto No. 2 in F Major, BWV 1047, I.

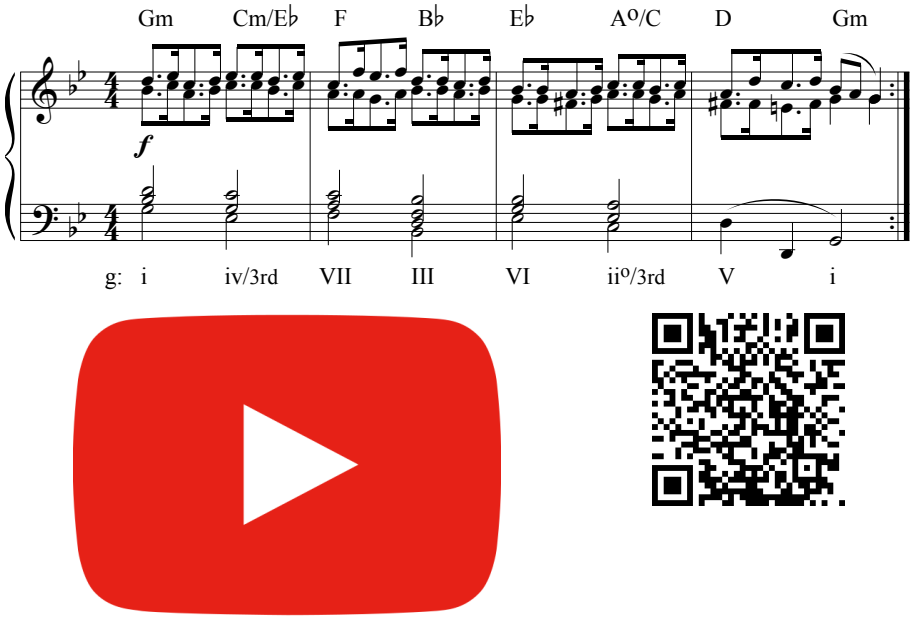


Figure 9.1.2 George Frideric Handel, Suite in G minor, Passacaglia

This circle (the circle of fifths *for harmonic progression*) is different than the circle of fifths for key signatures because this circle of fifths for *harmonic progression* contains diatonic notes only. The circle of fifths for key signatures (Figure 2.3.4) contained all 12 notes of the chromatic scale.

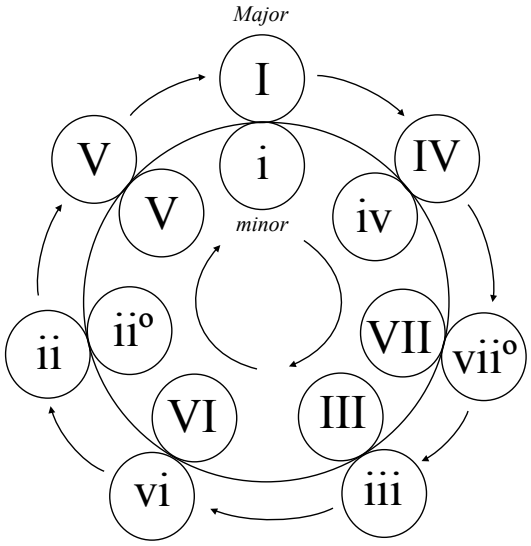


Figure 9.1.3 Circle of Fifths for Harmonic Progression

The circle of fifths (for harmonic progression) is sometimes known as the "circle of *descending* fifths."

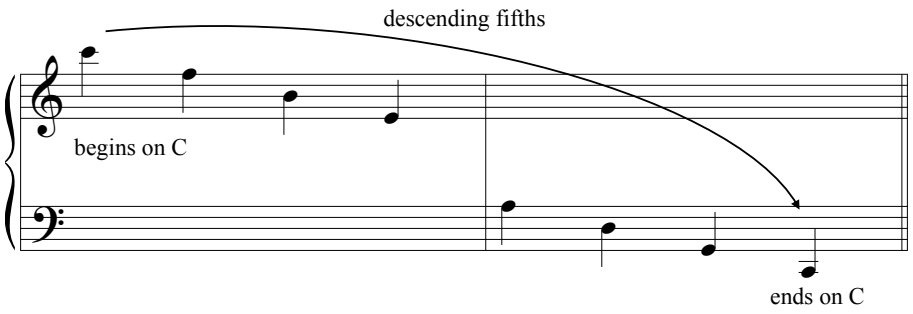


Figure 9.1.4 Circle of descending fifths occurring diatonically on the staff

The circle of fifths progression has been used regularly since the Baroque era.

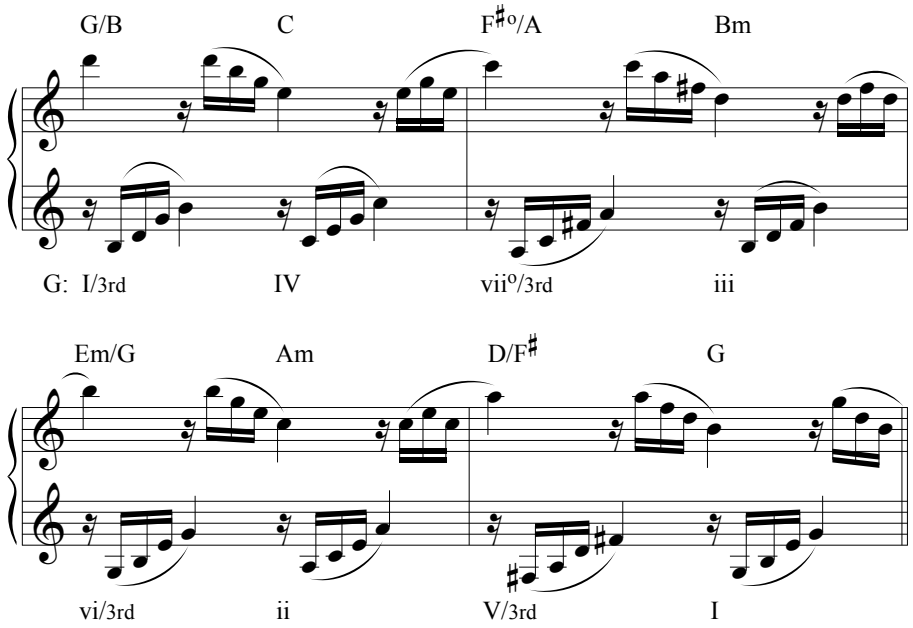


Figure 9.1.5 W.A. Mozart, Piano Sonata in C, K. 545, I (1780s)

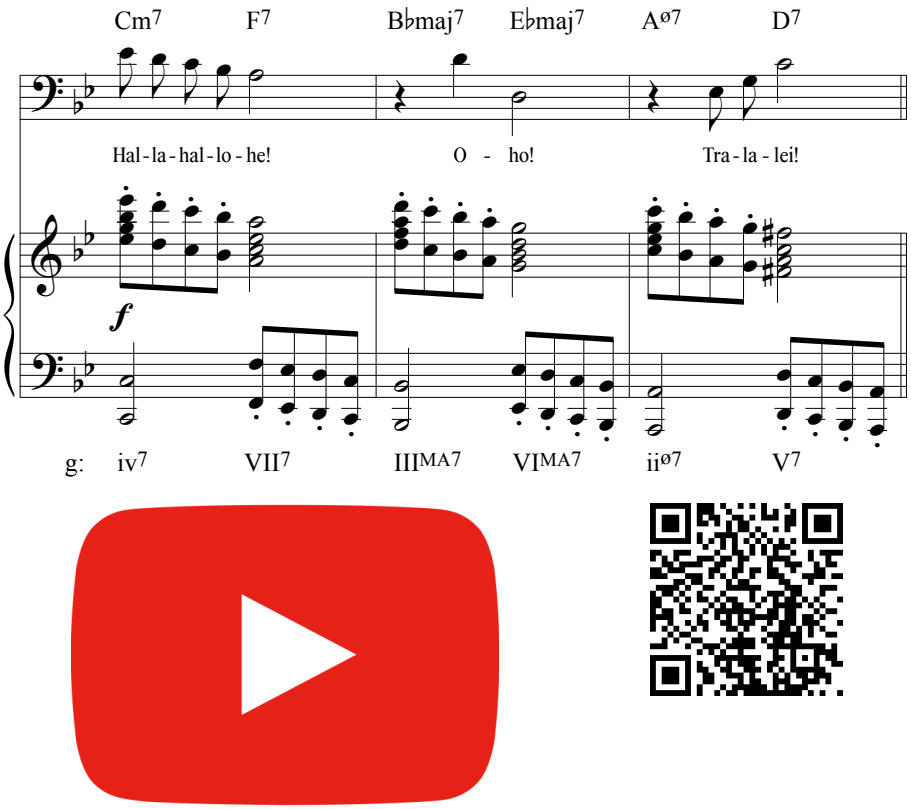


Figure 9.1.6 Richard Wagner, *Die Meistersinger*, Act II, Scene 6 (1860s)

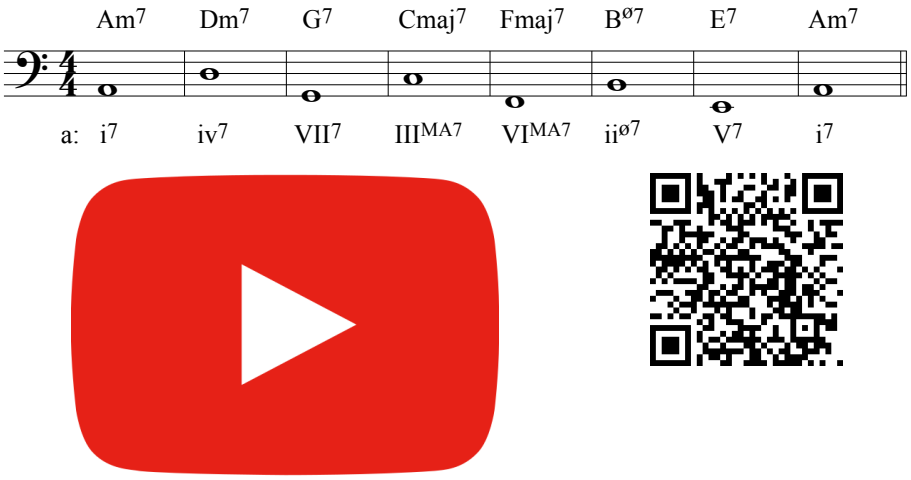


Figure 9.1.7 Bart Howard, "Fly Me to the Moon" (chords only) (1950s)

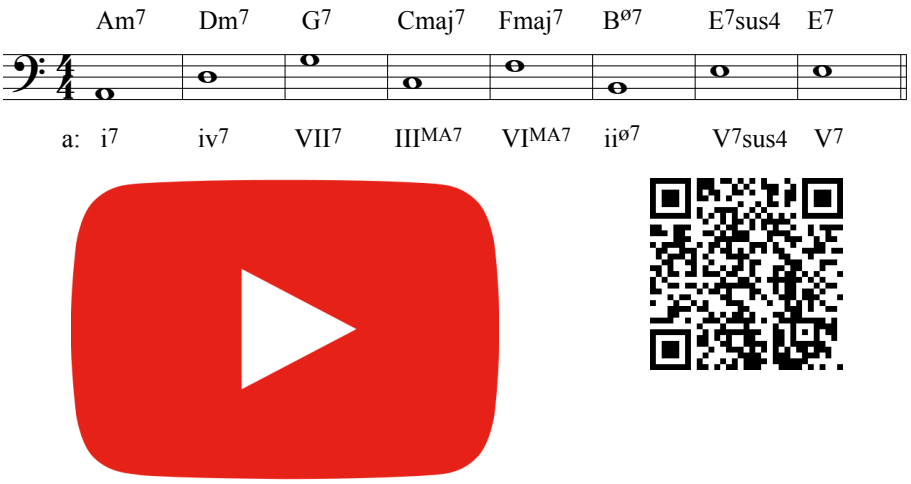


Figure 9.1.8 Freddie Perren and Dino Fekaris, "I Will Survive" (chords only) (1970s)

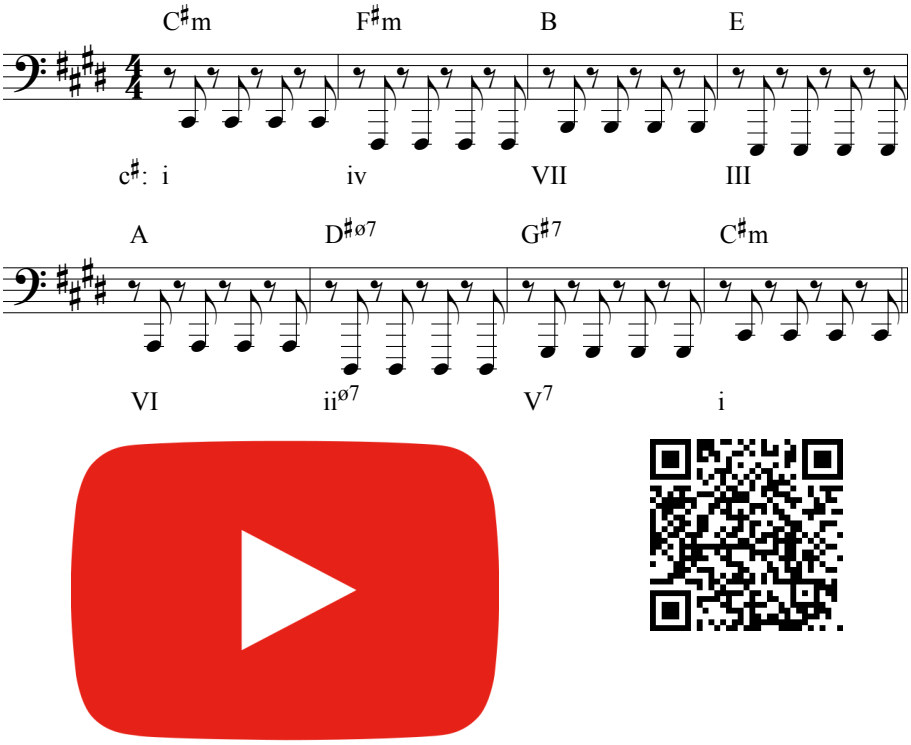


Figure 9.1.9 Antonina Armato, Tim James, Adam Schmalholz, "Love You Like A Love Song" (2010s) (bass and chords only)

The circle of fifths progression has a feeling of inevitability about it because it consists of **harmonic sequences**. To understand harmonic sequence we will first look at melodic sequences, since the bass line is the "melody" in a harmonic sequence. Ask yourself what happens after this melodic idea:

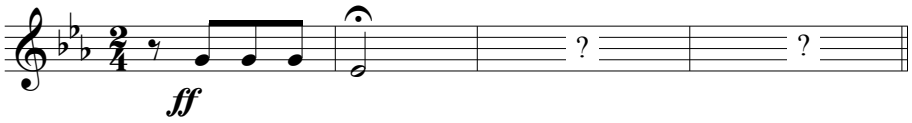


Figure 9.1.10 Beethoven, Symphony No. 5, Op. 67, I.

Definition 9.1.11 A **sequence** is a musical idea repeated at a different pitch level. ◊

Sequences can be short or long. For example, look at this familiar idea and notice how all four bars are sequenced down a step in the following four bars.

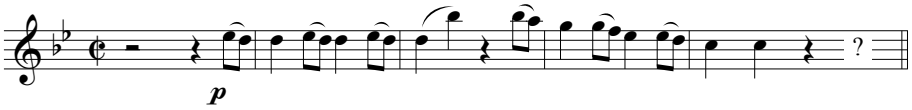


Figure 9.1.12 Mozart, Symphony No. 40, I.

Now look again at the bass line in "Love You Like A Love Song" and notice how it can be thought of a two-note idea treated as a descending sequence.

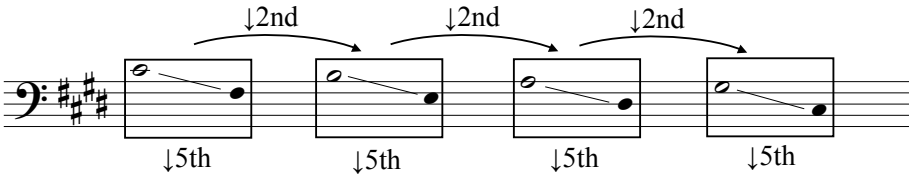


Figure 9.1.13 "Love You Like A Love Song" bass line sequence in groups of two notes

Sometimes we will hear a circle of fifths sequence where some of the chords are not in root position, as in the Handel and Mozart examples. In these two examples, we are hearing the sequence of the roots, even though they are not clearly presented in the bass.

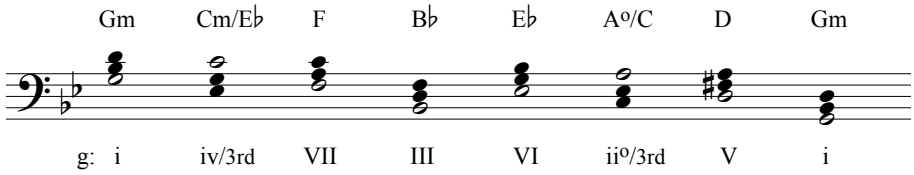


Figure 9.1.14 Handel Passacaglia with roots as open note heads

We will return to the idea of harmonic sequence later in this chapter.

9.2 Harmonic Rhythm

You will find that all of the progressions we discuss can have different harmonic rhythm. **Harmonic rhythm** is a term for how long each chord lasts. For example, in "Fly Me To The Moon" (Figure 9.1.7), "I Will Survive" (Figure 9.1.8), and "Love You Like A Love Song" (Figure 9.1.9), each chord lasts for four beats and has whole-note harmonic rhythm. In the Mozart (Figure 9.1.5) and Wagner examples (Figure 9.1.6), on the other hand, each chord lasted for two beats, and so had a faster harmonic rhythm.

Listen to the following example to hear four-beat harmonic rhythm change to two-beat harmonic rhythm.

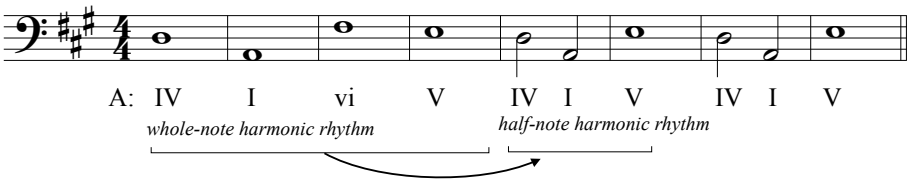


Figure 9.2.1 Dan Smith, "Pompeii"

In some music, harmonic rhythm will remain consistent, while in other pieces there will be an infinite variety to the length of harmonies. Throughout this text, we will be examining harmonic rhythm and the placement of harmonies within the phrase.

9.3 Shorter Progressions from the Circle of Fifths

9.3.1 II-V-I

The "ii–V–I" progression can be found in many pieces of music in all styles—classical, popular, but especially jazz, since the Great American Songbook (popular songs from the 1930s, 40's, and 50's) on which jazz repertoire is built contains many examples of this progression.

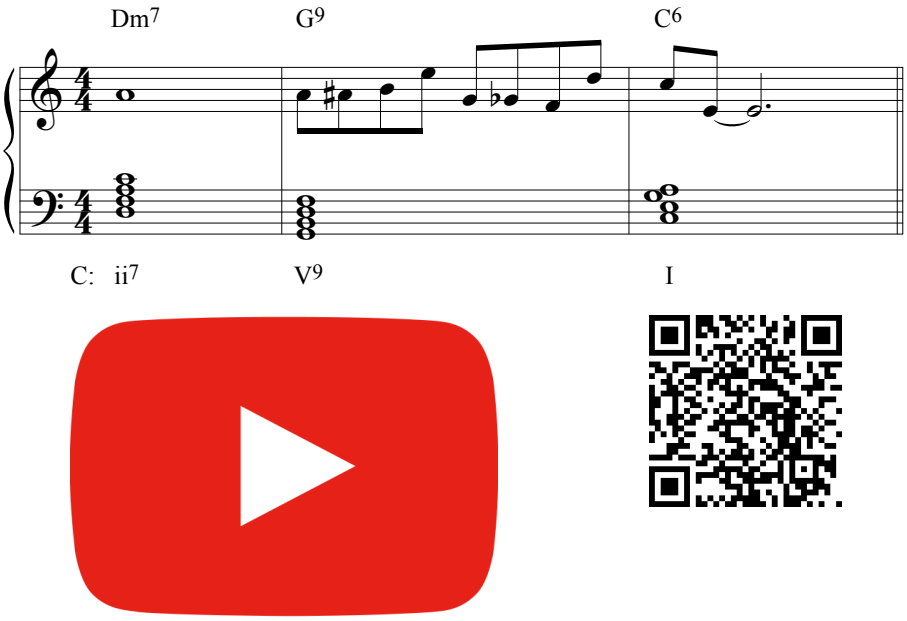


Figure 9.3.1 Duke Ellington, "Take the 'A' Train"

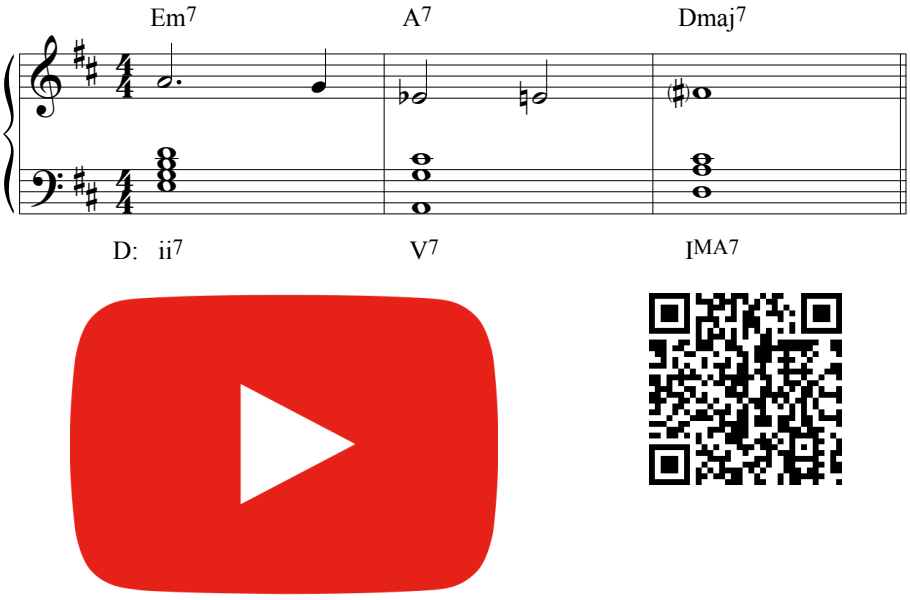


Figure 9.3.2 Miles Davis, "Tune-Up"

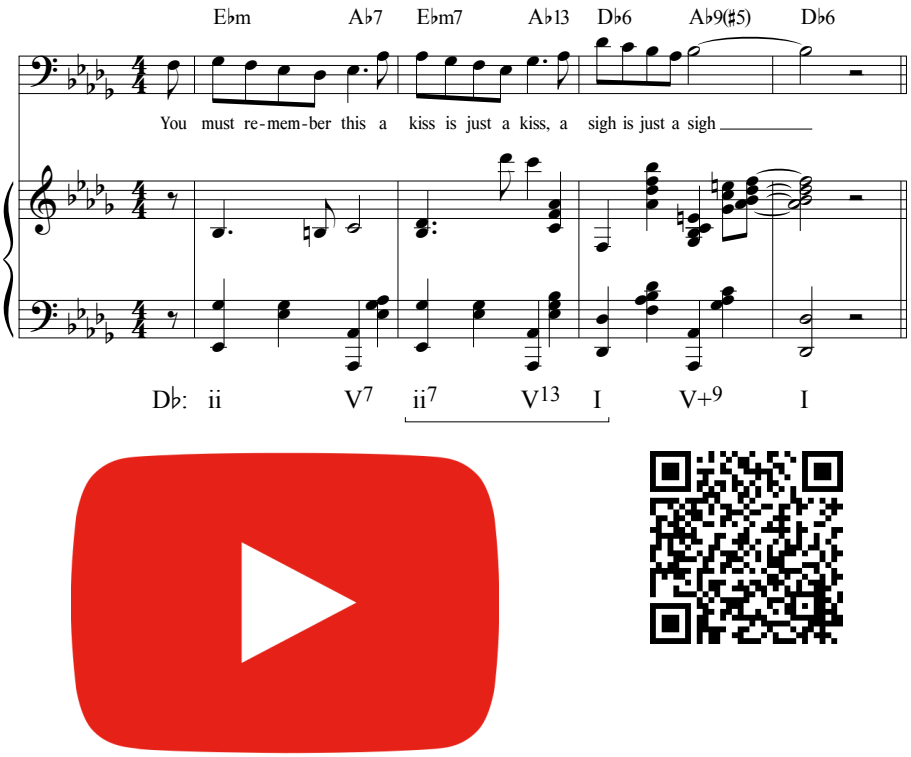


Figure 9.3.3 Herman Hupfeld, "As Time Goes By" (1931)

9.3.2 VI-II-V-I

This progression can occur in one of the following three ways (or orderings):

- vi–ii–V–I
- I–vi–ii–V
- ii–V–I–vi

One can think of these reorderings as rotations, as shown in the example below.

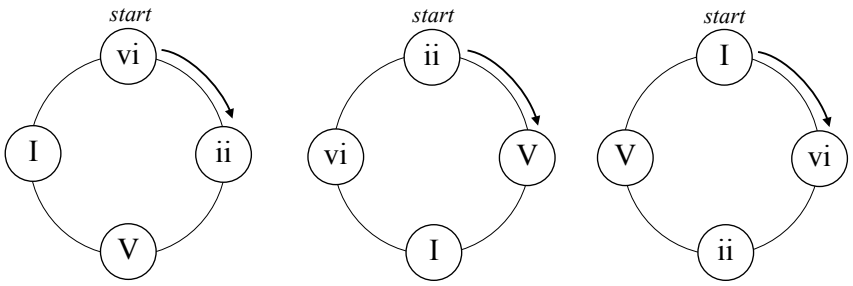


Figure 9.3.4 Rotations of the vi–ii–V–I progression

9.3.2.1 vi-ii-V-I

The vi–ii–V–I progression contains the last four chords of the circle of fifths progression.

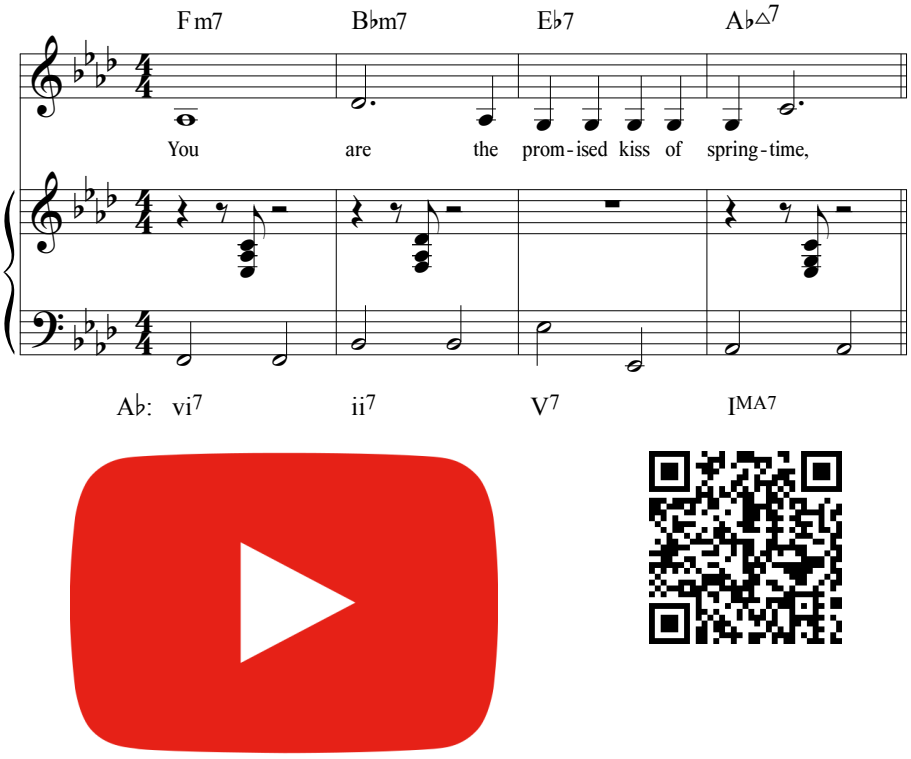


Figure 9.3.5 Jerome Kern, "All the Things You Are" (1939)

Here is another example from more recent popular music.

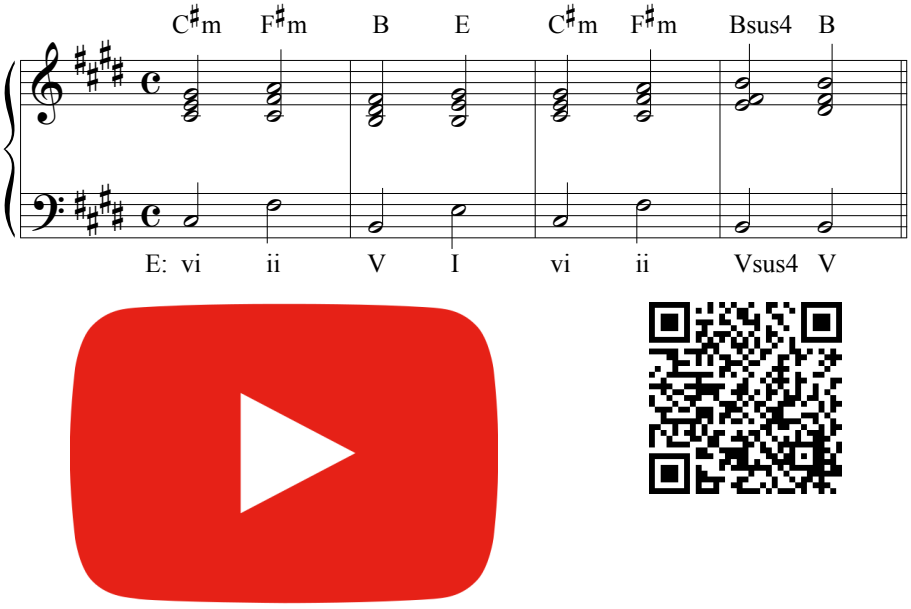


Figure 9.3.6 Søren Rasted, Claus Norreen, René Diff, and Lene Nystrøm, "Barbie Girl" (1997) (chords only)

9.3.2.2 I-vi-ii-V

Here are examples of the I–vi–ii–V progression, sometimes called the 1950s progression because of its prevalence during that decade, although this progression was also widely used in the 1930s and '40s.

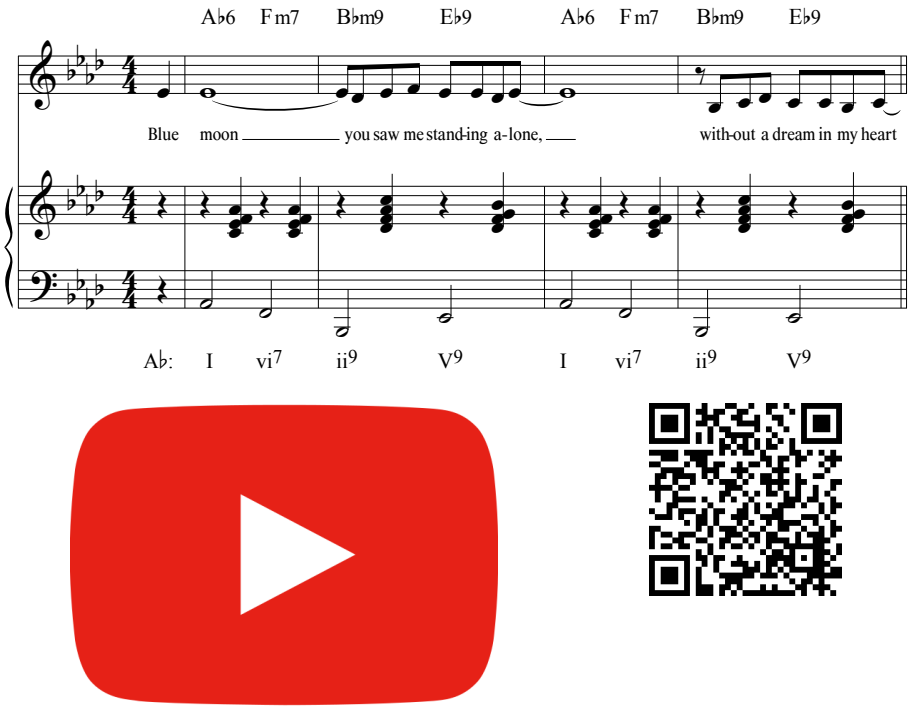


Figure 9.3.7 Richard Rodgers, "Blue Moon" (1934)

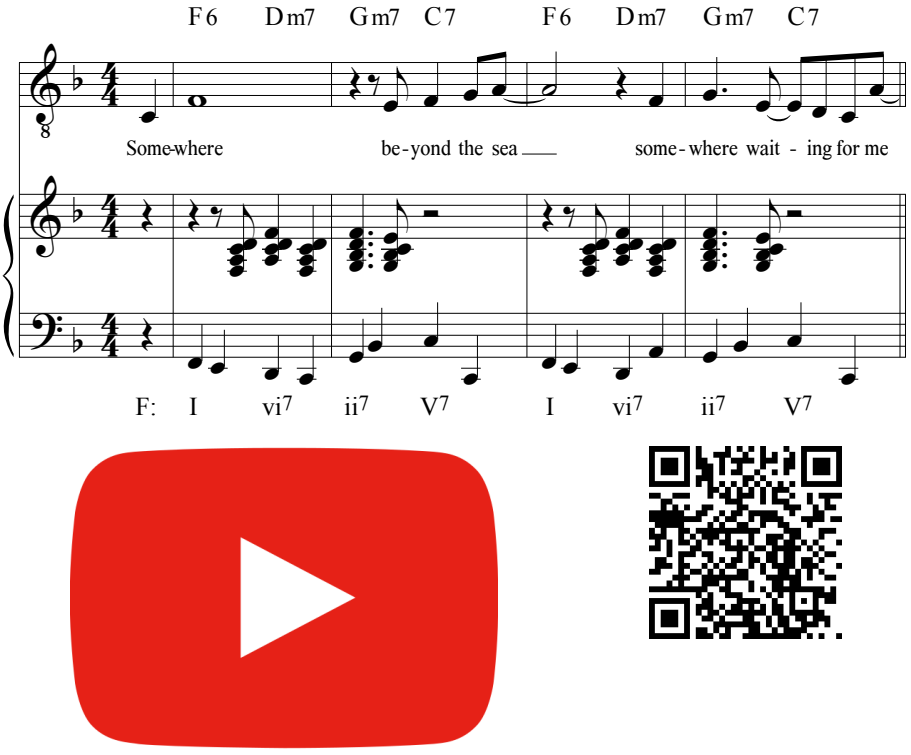


Figure 9.3.8 Charles Trenet and Albert Lasry, "Beyond The Sea" (1945)

Listen for this bass line in the next recording.

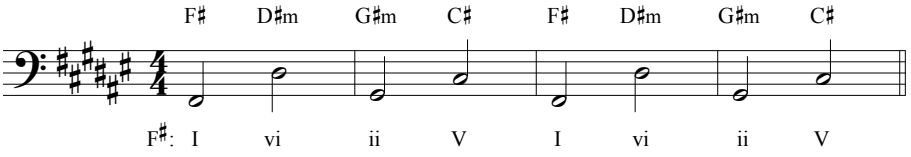


Figure 9.3.9 Frankie Lymon, Herman Santiago, Jimmy Merchant, "Why Do Fools Fall in Love" (1955)

9.3.2.3 ii-V-I-vi

Below is an example of the ii–V–I–vi progression. In this example, the vi chord acts as a link between the V–I cadence in the middle of the phrase and the ii chord at the beginning of the next phrase. This harmonic activity after the arrival on the I chord is like a "turnaround" in jazz. We discuss turnarounds more in a later chapter on jazz harmony.

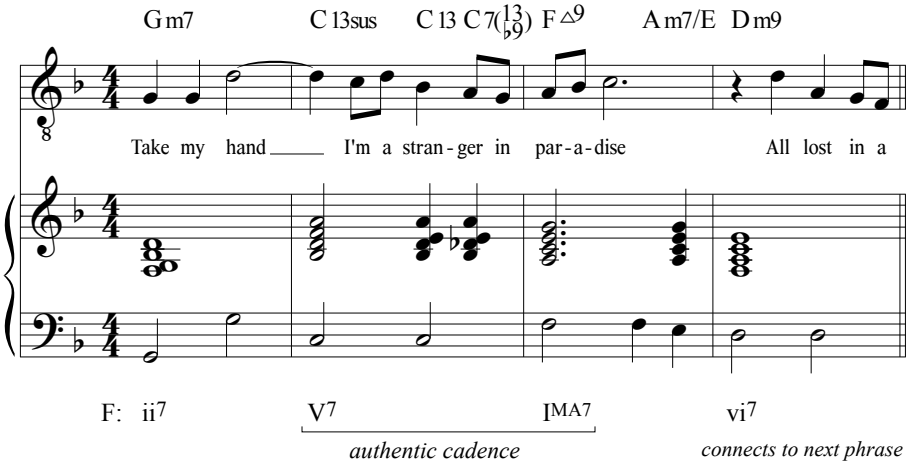


Figure 9.3.10 Robert Wright, George Forrest, Alexander Borodin, "Stranger in Paradise" (1953)

If you view this video on YouTube, you will briefly see the double bass part, which has lead-sheet symbols on it.

9.3.3 III-VI-II-V

The iii–vi–ii–V circle of fifths segment is sometimes repeated (or looped) within a song.

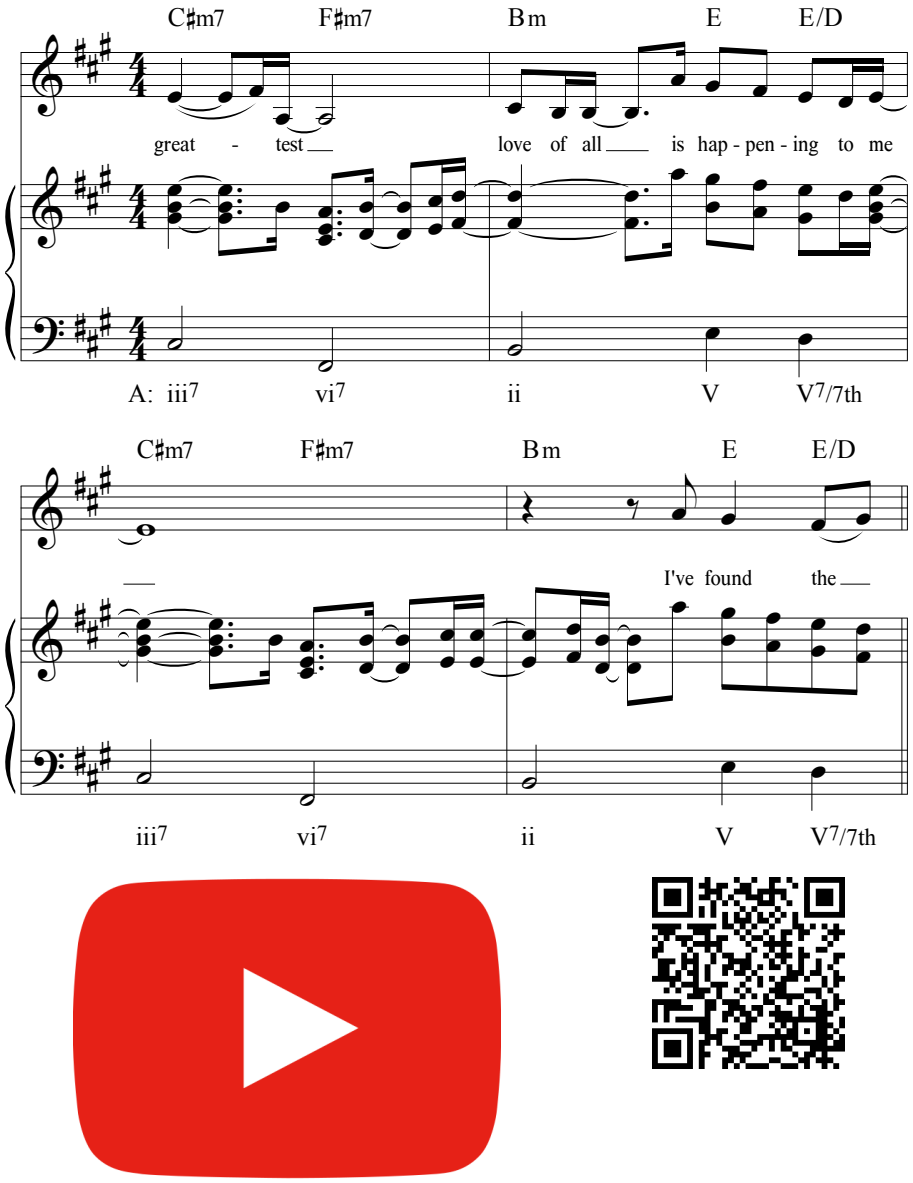


Figure 9.3.11 Michael Masser and Linda Creed, "Greatest Love of All" (1977)

Sometimes, this progression is rotated to ii–V–iii–vi, as in "September," the well known song by Earth, Wind, and Fire.

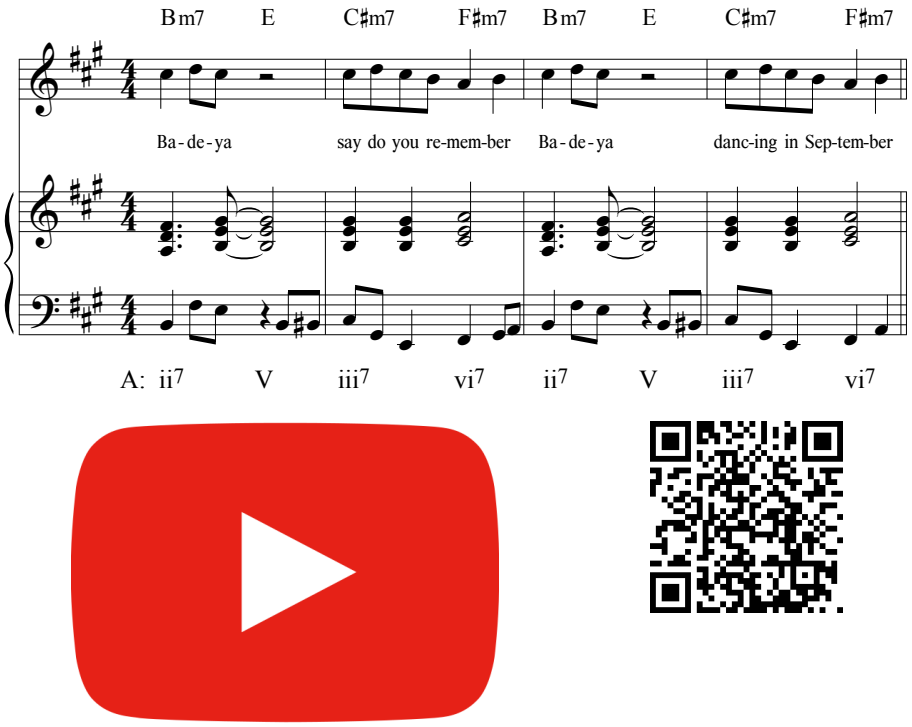


Figure 9.3.12 Maurice White, Al McKay, Allee Willis, "September" (1978)

This ii–V–iii–vi progression is also seen in the following song.

Figure 9.3.13 Mike Stock, Matt Aitken, and Pete Waterman, "Never Gonna Give You Up" (1987)

9.4 Harmonic Function

Now we will address non-circle-of-fifths progressions. Notice that we have not included the vii° or IV chord in any of the shorter circle of fifths progressions above. However, it is a common axiom that Rock 'n' Roll is made up of three

chords: I, IV, and V. This is because each of those chords represents a harmonic function. **Harmonic function** refers to the tendency of certain chords to progress to other chords, or to remain at rest. Many texts on music theory enumerate three harmonic functions. In this text, we will discuss four.

1. Tonic function (abbreviated "ton."): The I chord has tonic function, which is a state of stability and rest. Tonic chords do not demand progression to other chords.

2. Dominant function (abbreviated "dom."): The V and vii° (chords containing the leading tone $\hat{7}$ and supertonic $\hat{2}$) tend to progress to tonic (I). *Special note*: The I/5th chord has *dominant* function when it resolves to the V chord, as in the third chord from the end of the "Star-Spangled Banner."

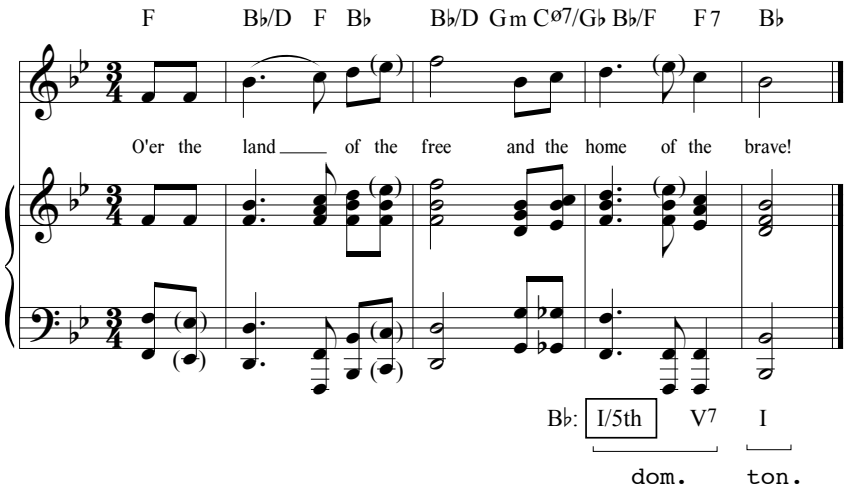


Figure 9.4.1 Key and Smith, "The Star-Spangled Banner"

3. Pre-dominant function (abbreviated "pre-dom."): The IV and ii (chords containing the subdominant $\hat{4}$ and submediant $\hat{6}$) tend to progress to chords of dominant function.

4. Tonic prolongation function (abbreviated "ton. prol."): The vi and iii (chords that share two common tones with $\hat{1}$–$\hat{3}$–$\hat{5}$ from the tonic triad) tend to occur after the tonic chord and progress to chords of pre-dominant function.

Harmonic function is represented on a flowchart in the next section.

9.4.1 The Harmonic Flowchart

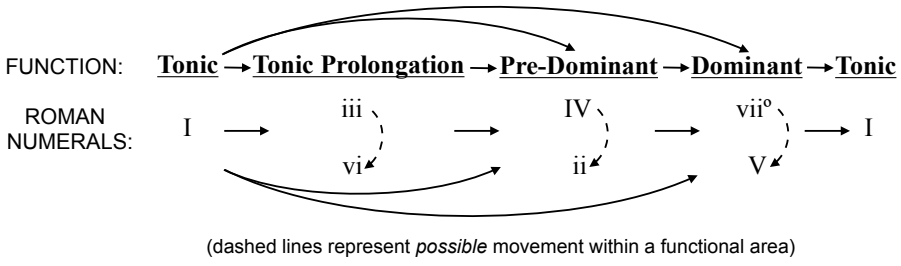


Figure 9.4.2 Harmonic Flowchart in Major

Remember that IV goes to I in the plagal cadence and V goes to vi in the deceptive cadence. When IV goes to I, label IV as having *tonic prolongation* function. *The plagal cadence and deceptive cadence are exceptions to the harmonic flowchart.*

Here is the Harmonic Flowchart in minor. Note the addition of the subtonic VII chord, which has one function—to progress to III.

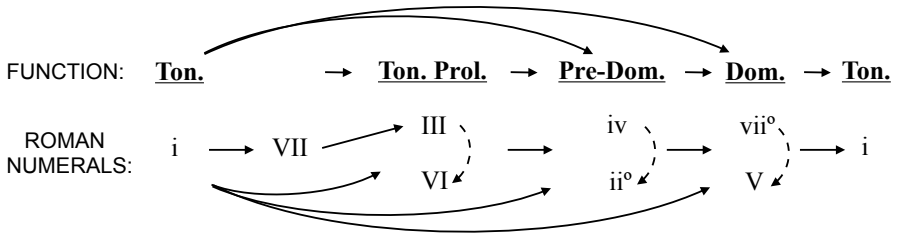


Figure 9.4.3 Harmonic Flowchart in Minor

The tonic chord I can progress directly to a chord of any other function and, in fact, many pieces begin with a I–V–I progression, representing harmonic function of Tonic-Dominant-Tonic.

9.4.2 Tonic-Dominant-Tonic Progression

This is the most elemental progression in music, often realized with I–V–I.

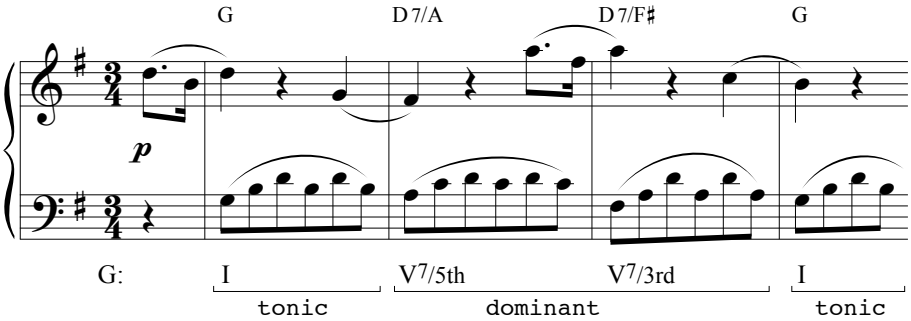


Figure 9.4.4 W.A. Mozart, Piano Sonata, K. 283, I.

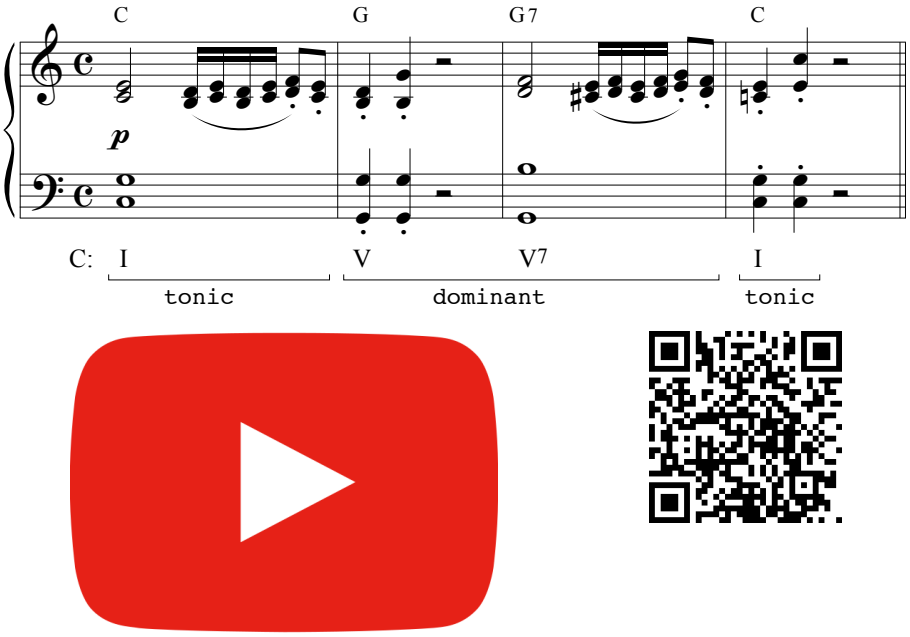


Figure 9.4.5 Ludwig van Beethoven, Piano Sonata in C major, Op. 2, No. 3, I.

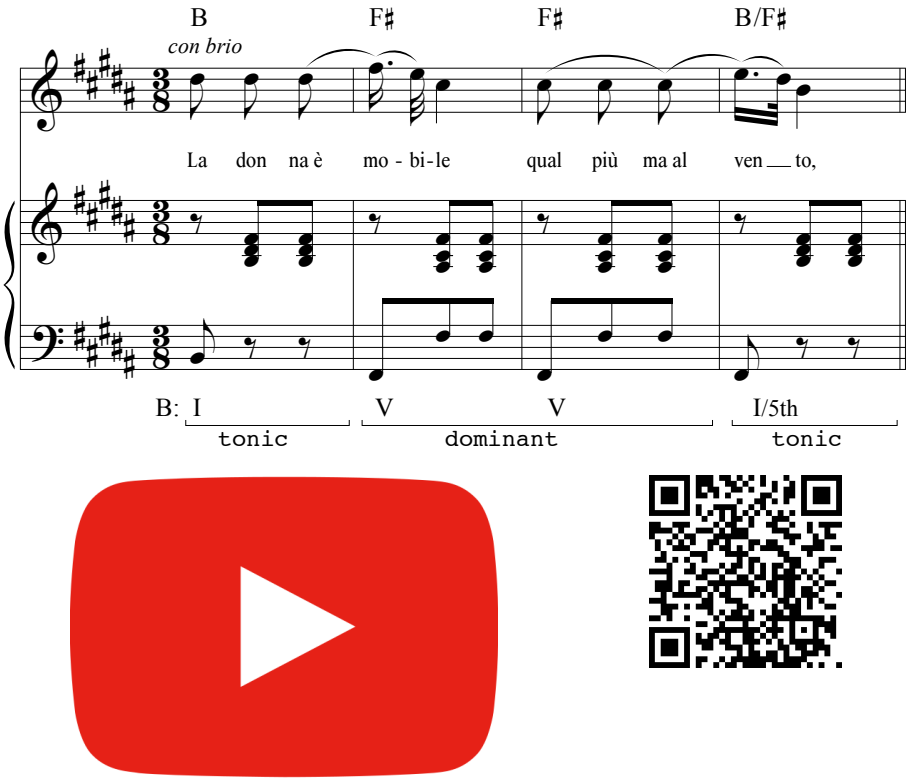


Figure 9.4.6 Giuseppe Verdi, *Rigoletto*, "La donna è mobile"

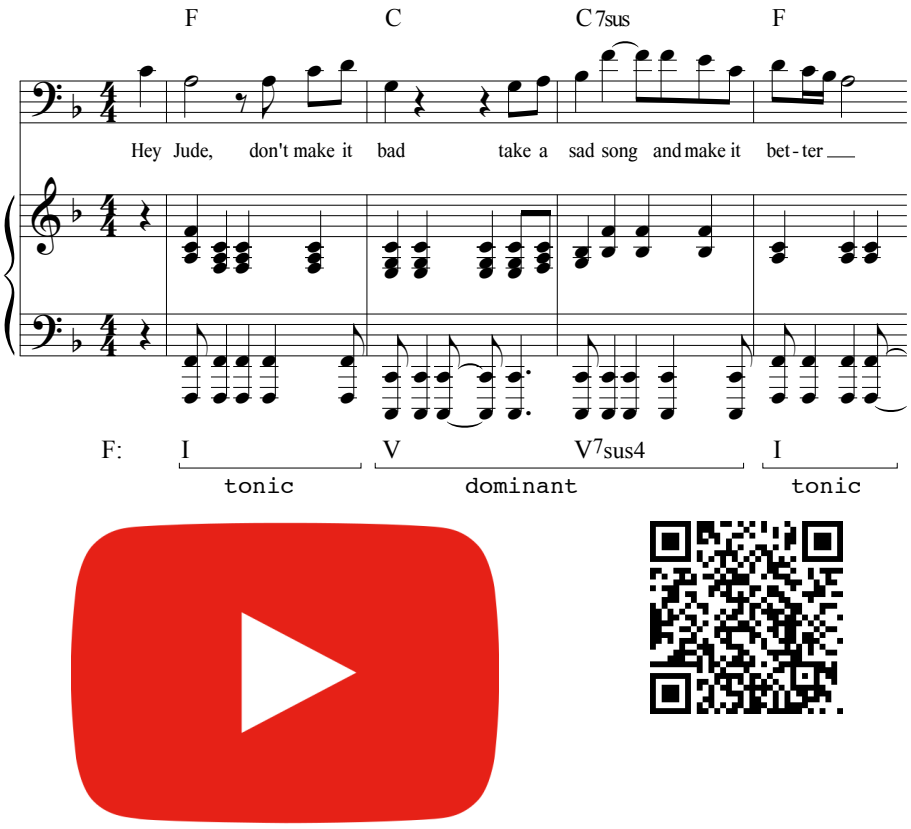


Figure 9.4.7 Lennon-McCartney, "Hey Jude"

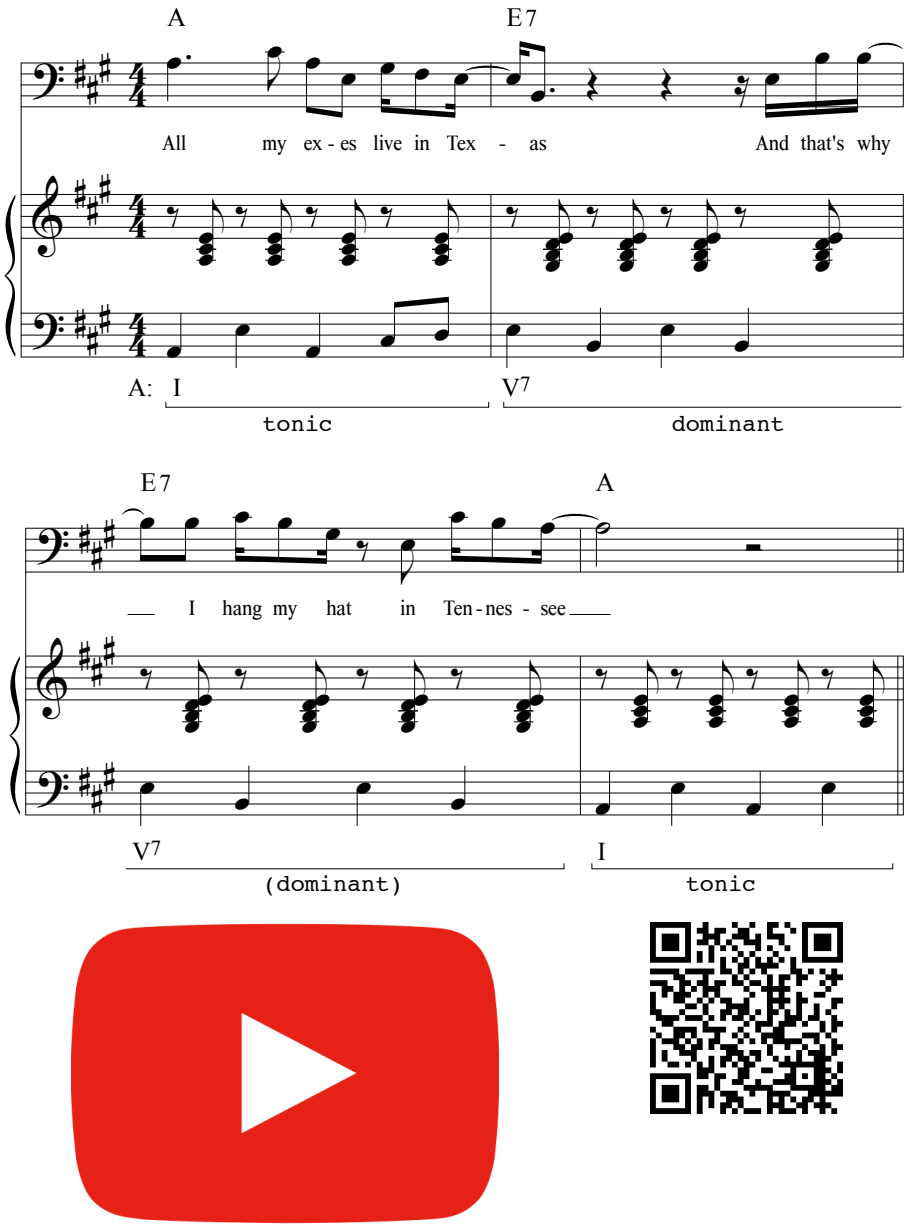


Figure 9.4.8 Sanger D. Shafer and Linda J. Shafer, "All My Ex's Live in Texas" (1986)

The principle of "Tonic-Dominant-Tonic" could also be represented with I–vii°–I. Even though we learned that "dominant" means "$\hat{5}$" (and also "V") in earlier sections, "dominant *function*" in terms of harmony means "a chord that *progresses to* the tonic chord." We will revisit this concept and other possibilities for "dominant function" later.

9.4.3 Tonic-PreDominant-Dominant-Tonic Progression

This sequence of harmonic functions can be realized in four possible ways:

- I–ii–V–I
- I–IV–V–I

- I–IV–vii°–I
- I–ii–vii°–I

Here are examples with I–ii–V–I.

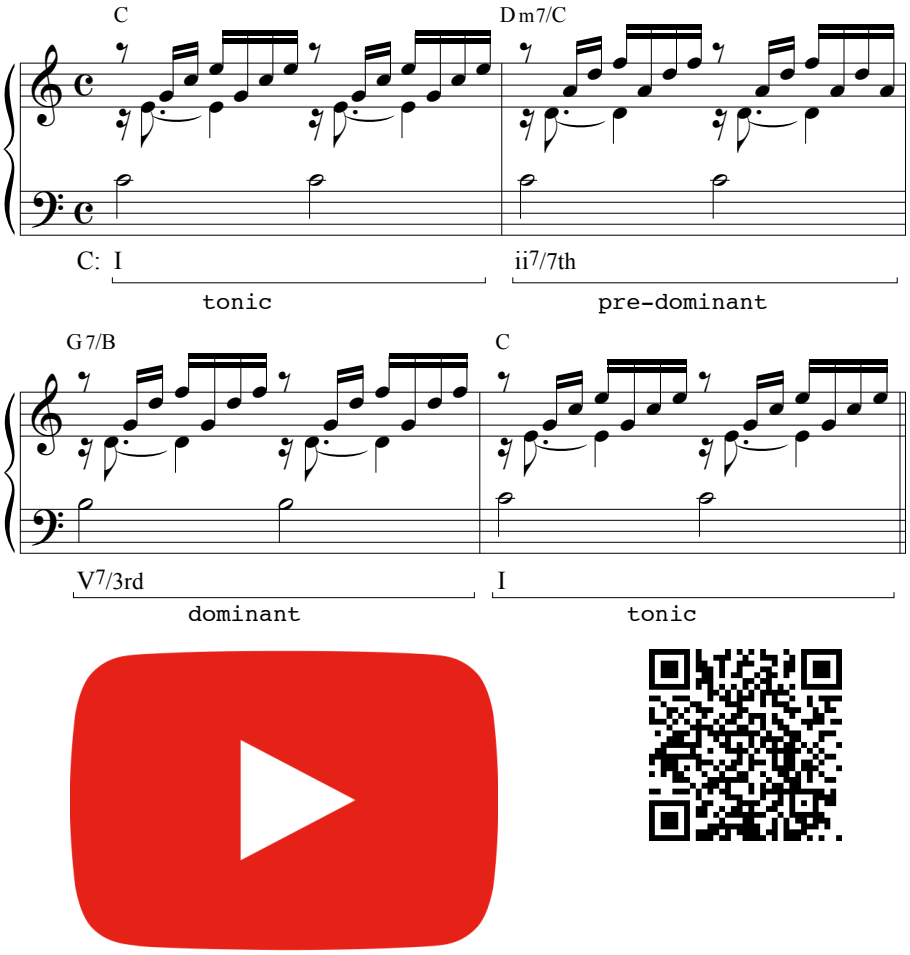


Figure 9.4.9 J.S. Bach, *Well-Tempered Clavier, Book I*, Prelude 1 in C major BWV 846

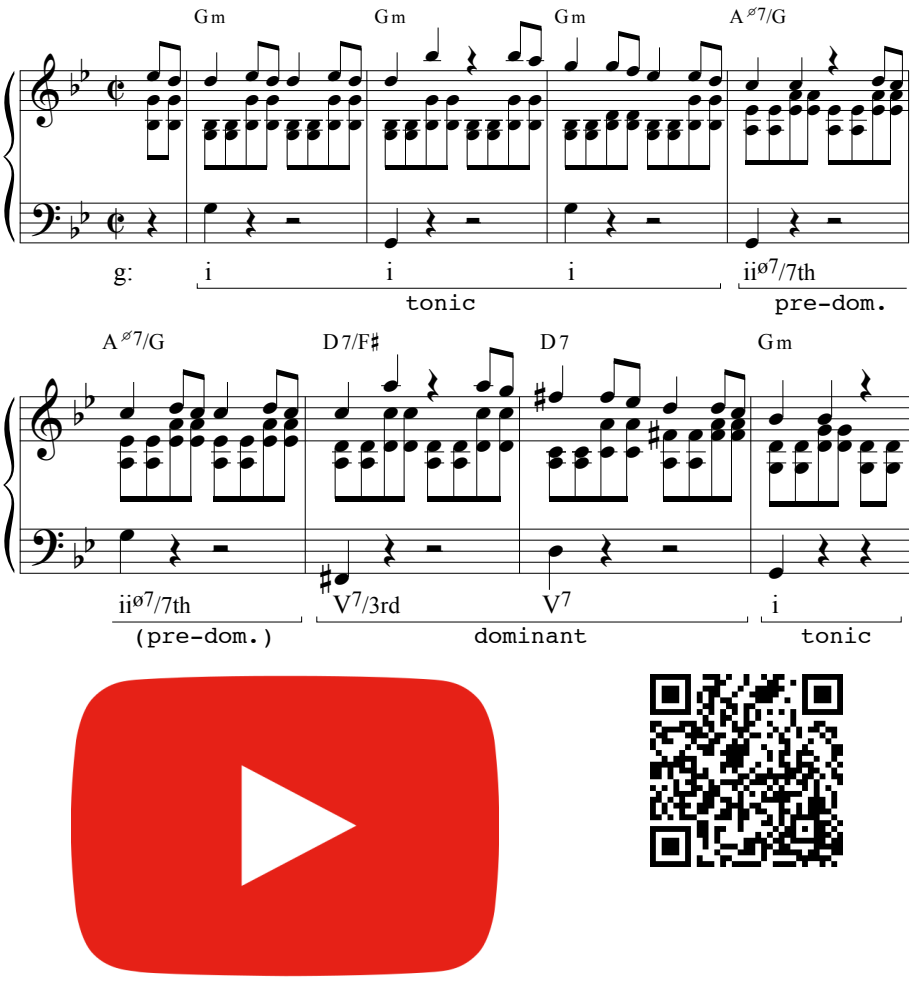


Figure 9.4.10 W.A. Mozart, Symphony No. 40 in G minor, K. 550, I. (textural reduction)

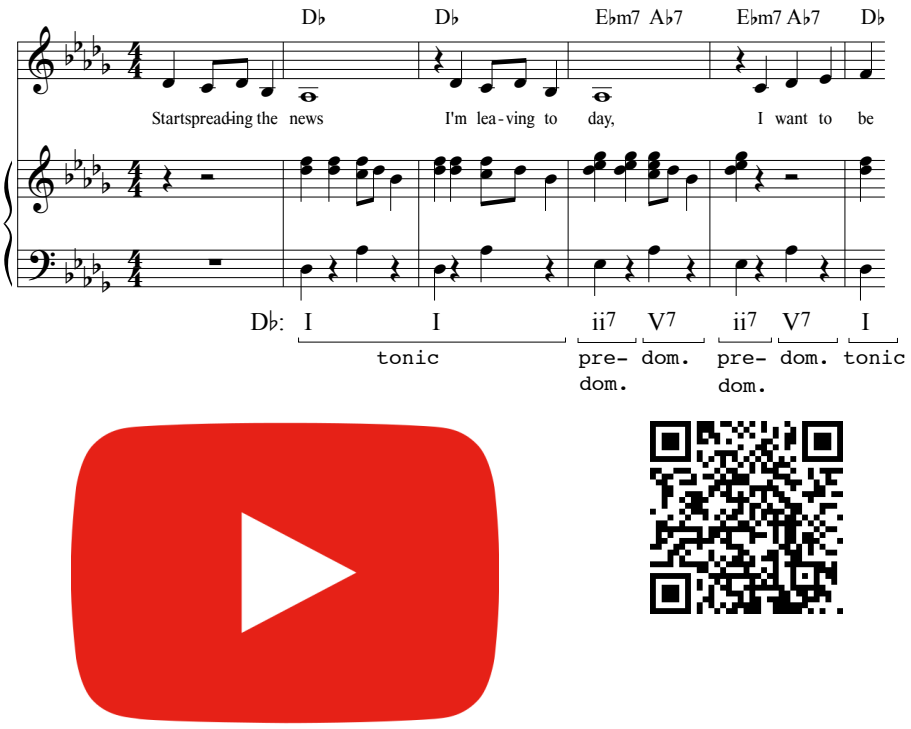


Figure 9.4.11 John Kander and Fred Ebb, "Theme from *New York, New York*" (1977)

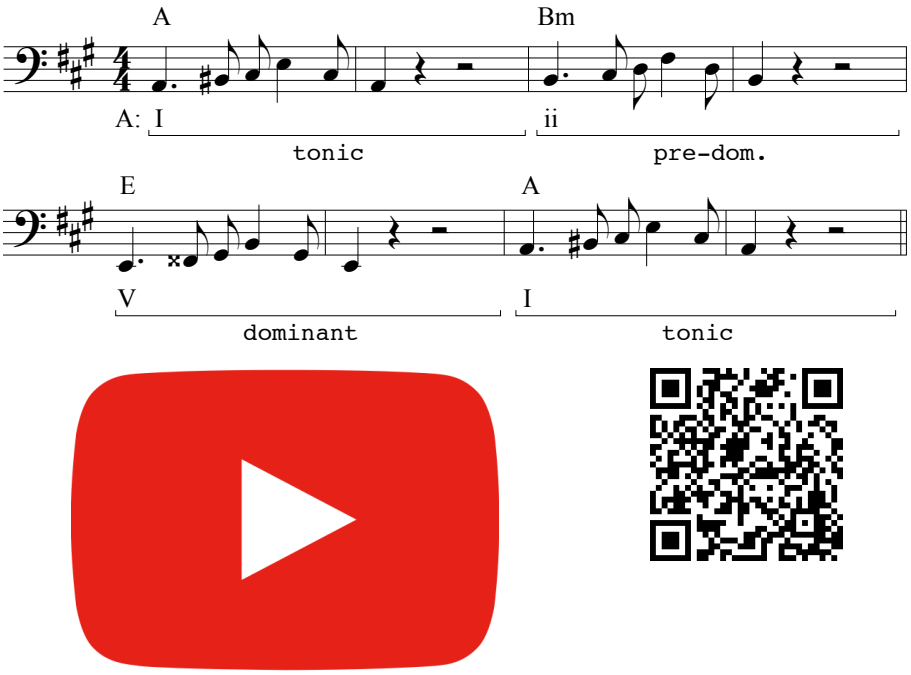


Figure 9.4.12 Meghan Trainor and Kevin Kadish, "All About That Bass" (bass line and chord symbols only) (2014)

Here are examples with I–IV–V–I realizing the Ton-PreDom-Dom-Ton progression.

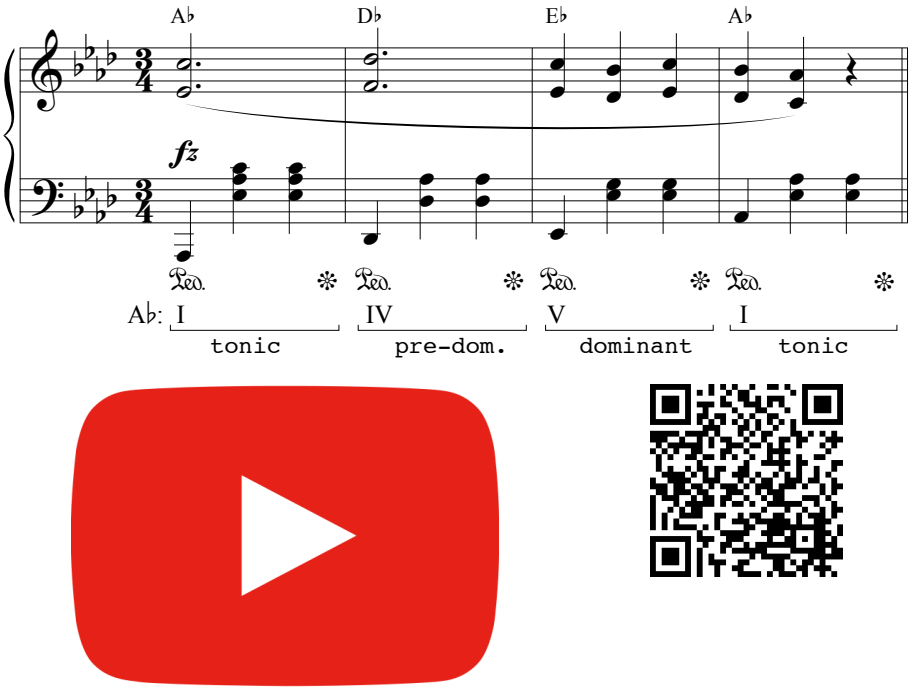


Figure 9.4.13 Frédéric Chopin, Waltz in A-flat major, Op. 34 No. 1

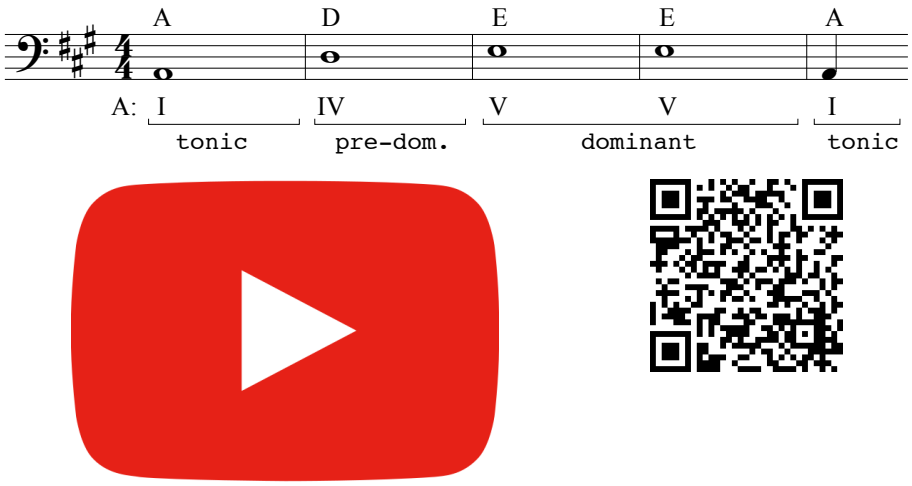


Figure 9.4.14 David Crane, Marta Kauffman, Michael Skloff, Allee Willis, Phil Solem, Danny Wilde, "I'll Be There For You" (bass line and chords only) (1995)

Progressions using vii° (I–IV–vii°–I and I–ii–vii°–I) are less common because of the instability of diminished chords.

9.4.4 The Tonic-Tonic Prolongation-PreDominant-Dominant Progression

This progression is most commonly realized with I–vi–IV–V, although in classical music one will often encounter I–vi–ii/3rd–V (mentioned above in the section on vi–ii–V–I).

Notice the bass line starts with descending thirds.

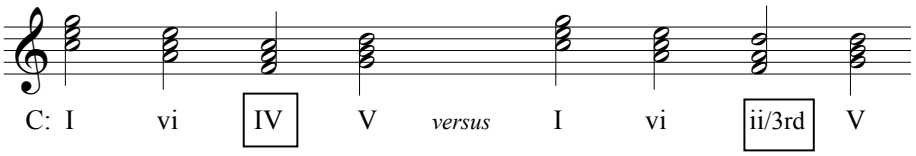


Figure 9.4.15 Compare I–vi–IV–V to I–vi–ii/3rd–V (the bass lines are the same)

Here is a musical example with I–vi–ii/3rd–V.

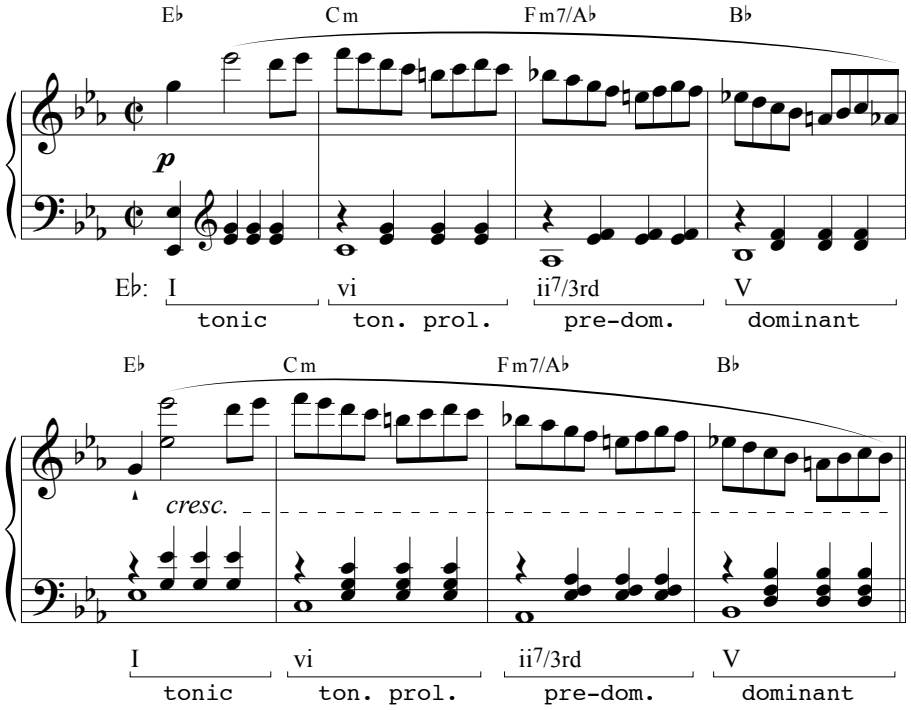


Figure 9.4.16 Ludwig van Beethoven, Pathétique Sonata, Op. 13, I

9.4.4.1 I–vi–IV–V

As mentioned earlier, the progression I–vi–IV–V was so prevalent in the 1950s that it is known as the "**'50s progression**" and the "'50s doo-wop progression."

Listen for this bass line in the following examples.

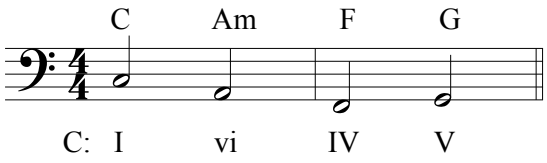


Figure 9.4.17 I–vi–IV–V bass line in C major

- Hoagy Carmichael and Frank Loesser, "Heart and Soul" (in C major)

- Curtis Williams, Jesse Belvin, Gaynel Hodge, "Earth Angel" (in A-flat major) (1954)

- Dolly Parton, "I Will Always Love You" (in A major) (1974)

- Johnny Ramone, Dee Dee Ramone, Joey Ramone, "Rock 'n' Roll High School" (in C major) (1978)

In the above examples, the chords have have half-note harmonic rhythm. In the following example, the chords have whole-note harmonic rhythm (4 beats per chord).

- John Stephens and Toby Gad, "All of Me" (in A-flat major) (2013)

The I–vi–IV–V progression can also be rotated to IV–V–I–vi, as in the following example.

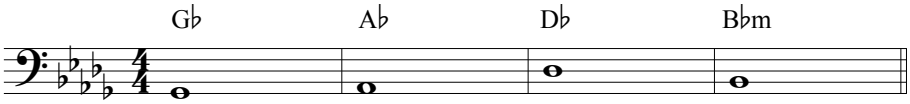


Figure 9.4.18 Nasri Atwey, Adam Messinger, Mark Pellizzer, Ben Spivak, Alex Tanas, "Rude" (bass line and chords only) (2014)

You will see more examples of Tonic-Tonic Prolongation-PreDominant-Dominant progressions, including the use of the iii chord, in the Practice Exercises and the Homework.

Remember, there are two exceptions in Harmonic Function: IV has tonic prolongation function when it progresses to I, and I/5th has dominant function when it progresses to V.

9.5 Exceptions Created by Harmonic Sequences

Exceptions to the harmonic flowchart often can be explained by harmonic sequences.

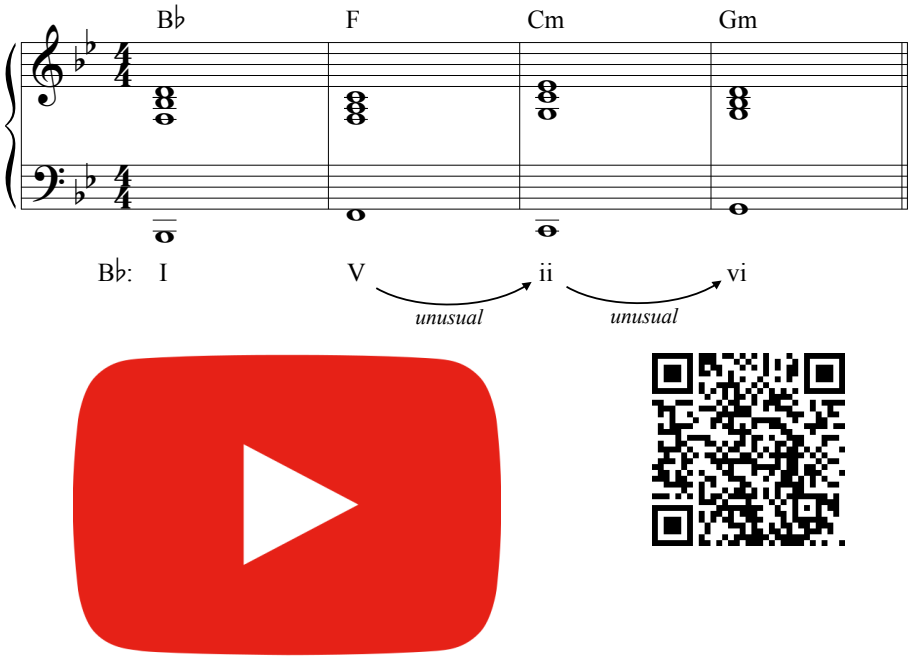


Figure 9.5.1 Keith Forsey, Giorgio Moroder, Irene Cara, "Flashdance... What A Feeling" (1983)

The sequence is between the first two bars and the last two bars of the example.

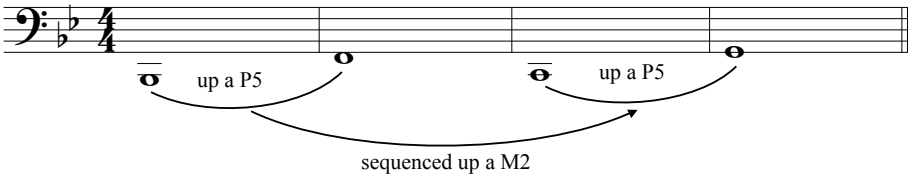


Figure 9.5.2 Exceptions in "Flashdance... What A Feeling" created by sequence

There are unusual chord resolutions in the verse of "Hotel California," in the example below.

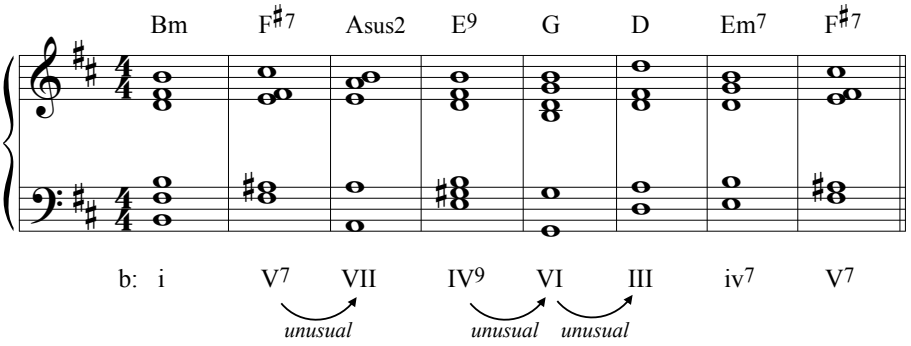


Figure 9.5.3 Don Felder, Don Henley, Glenn Frey, "Hotel California" (1977)

The example below shows how these exceptions come about through harmonic sequences.

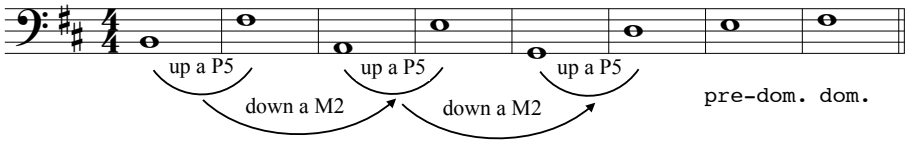


Figure 9.5.4 Exceptions in "Hotel California" created through sequences

Look for harmonic sequences as a possible explanation when you encounter unusual chord progressions.

9.6 The Subtonic VII Chord in Popular Music

Although we will discuss mode mixture and the Mixolydian mode later, the ubiquity of the subtonic chord (♭VII) in rock and popular music makes it important to discuss here.

The ♭VII chord can precede tonic, dominant, and pre-dominant chords, which means it can substitute for any function except tonic.

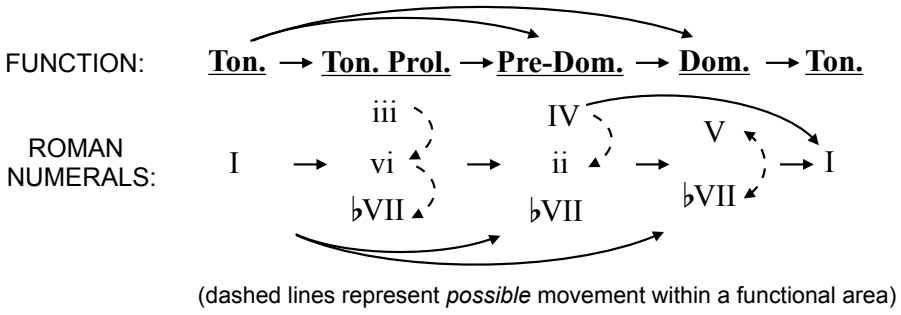


Figure 9.6.1 Harmonic Flowchart for Popular Music with Subtonic VII chord in Major

Notice also that movement from IV–I (from the plagal cadence) is common in the following examples from popular music.

Here are examples ending with ♭VII–IV–I, where IV progresses to I (a plagal cadence) and is preceded by ♭VII.

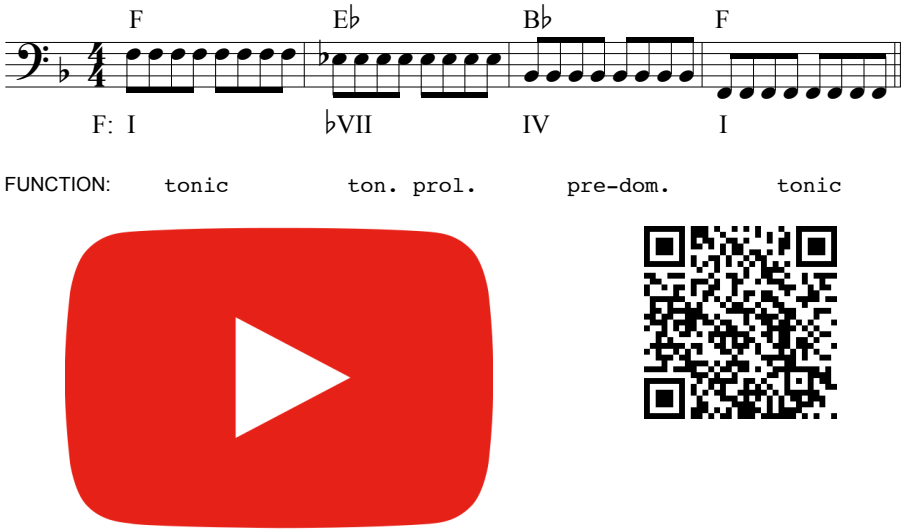


Figure 9.6.2 Lennon-McCartney, "Hey Jude" (bass line and chords only) (1968)

Consider the following questions: When a phrase ends on the IV chord, does it have dominant function (i.e, is it a half cadence)? Does IV have dominant function in popular music when it progresses to I? If so, does ♭VII have pre-dominant function in the above progression?

Notice that ♭VII begins the phrase in the following example, and proceeds to a IV–I conclusion.

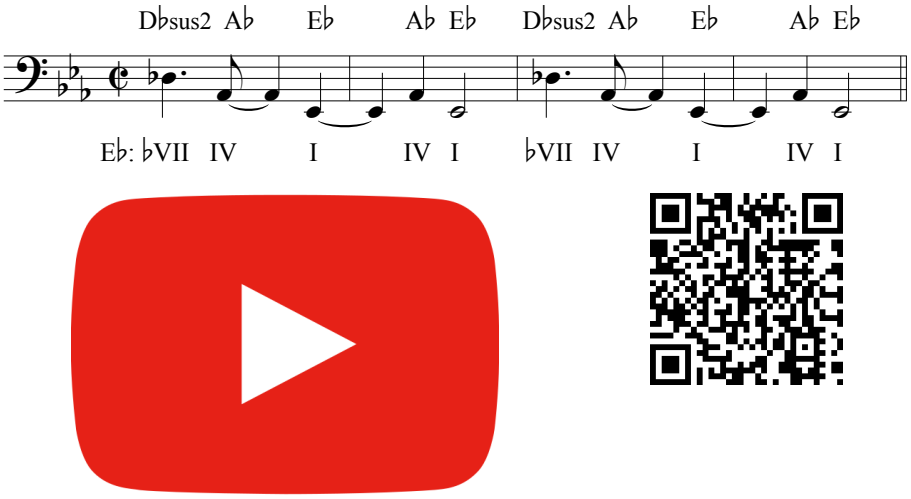


Figure 9.6.3 U2, "Desire" (bass line and chords) (1988)

The following example has ♭VII preceding *and following* the IV chord. Does the ♭VII chord have tonic prolongation as labeled, or is it "pre pre-dominant" in function?

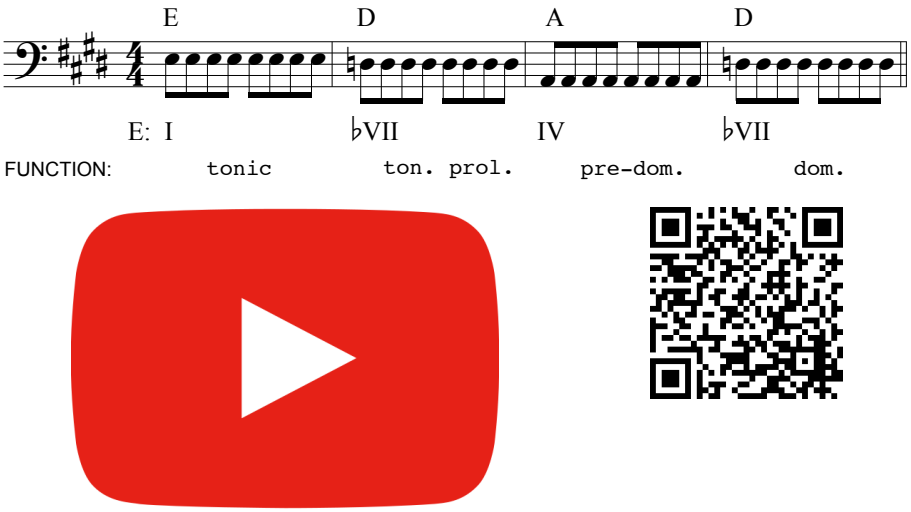


Figure 9.6.4 Keith Forsey and Steve Schiff, "Don't You (Forget About Me)" (bass line and chords) (1985)

Here is an example with ♭VII cadencing to the I chord in the first four bars then progressing to the vi chord in a deceptive cadence in the second four bars.

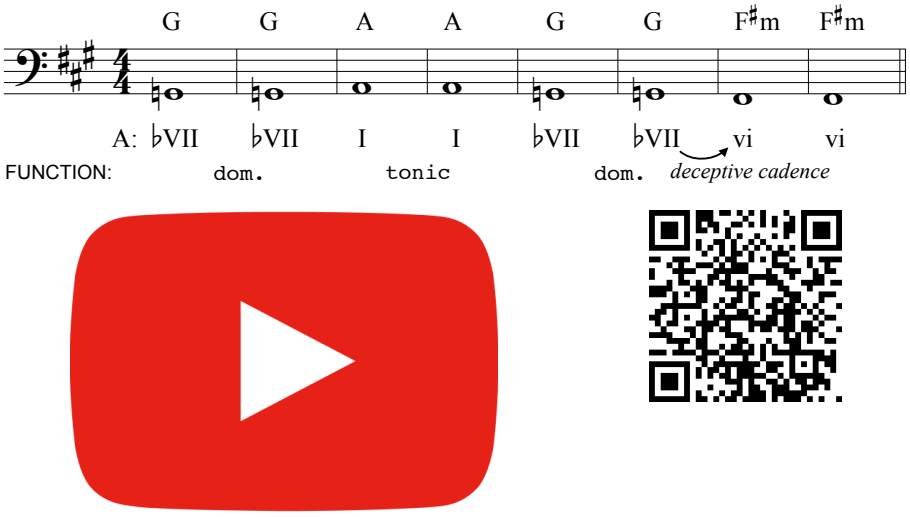


Figure 9.6.5 Walter Becker and Donald Fagen, "Reelin' in the Years" (bass line and chords)

9.7 The Best-Seller Progression

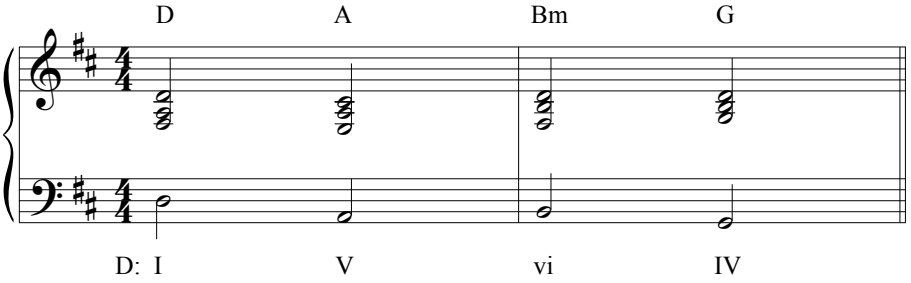


Figure 9.7.1 The I–V–vi–IV "Best-Seller" Progression

The I–V–vi–IV progression occurs in many popular songs, has a Wikipedia page, and has been mentioned in a New Yorker article about bestselling novels (see the third paragraph from the end of the article). The music group Axis of Awesome made a compilation of several songs with the I–V–vi–IV progression that makes for an entertaining summary (warning: there is some language after the 5-minute mark).

Here is a written-out example that includes the I–V–vi–IV progression.

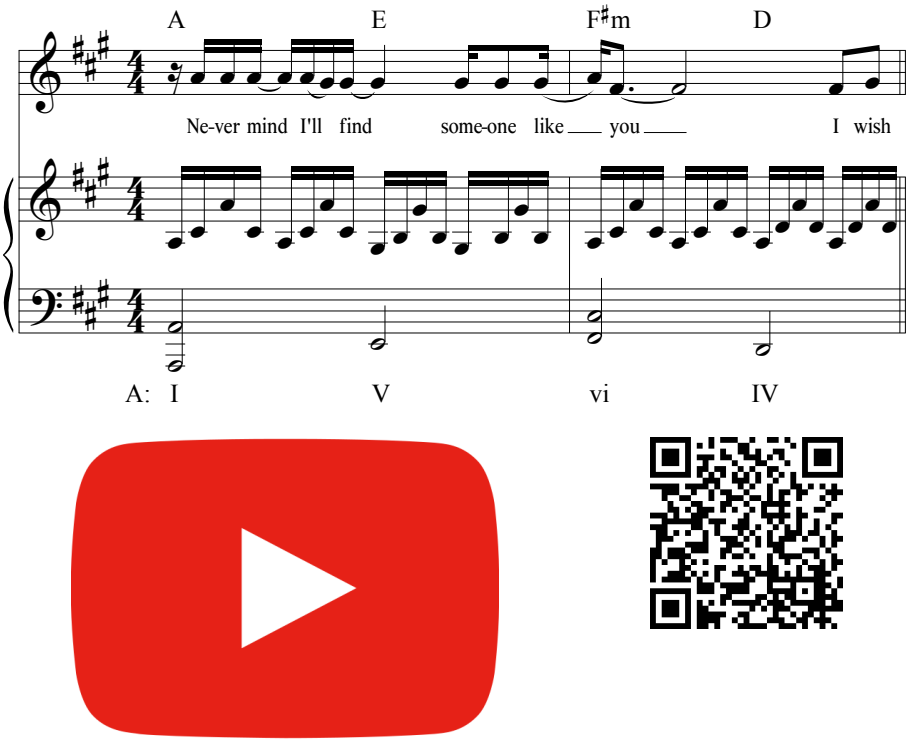


Figure 9.7.2 Adele Adkins and Dan Wilson, "Someone Like You" (2011)

The I–V–vi–IV progression can be rotated to become vi–IV–I–V and IV–I–V–vi.

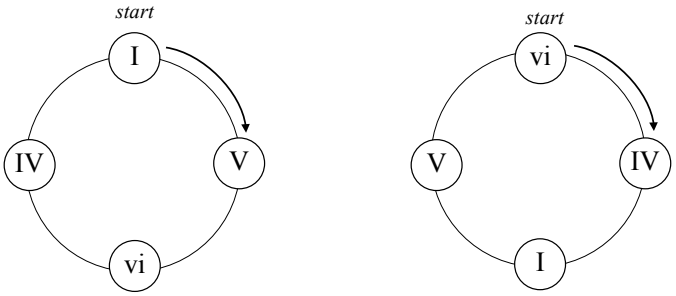


Figure 9.7.3 Example of I–V–vi–IV rotation to vi–IV–I–V

Here is an example with the vi–IV–I–V progression.

Figure 9.7.4 Adele Adkins and Greg Kursten, "Hello" (2015)

The vi–IV–I–V progression can also be thought of as being in minor: i–VI–III–VII

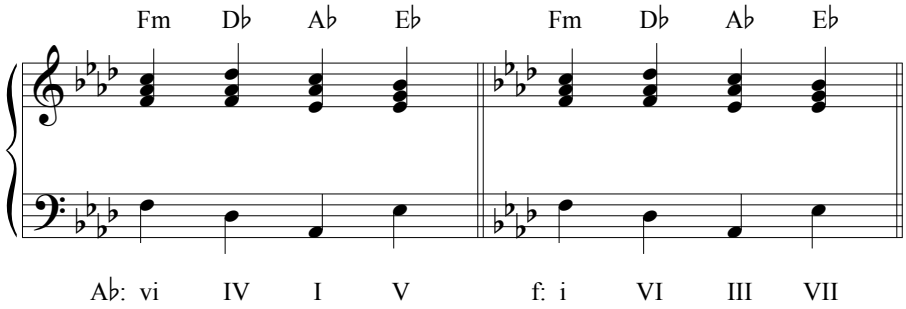


Figure 9.7.5 "Best-Seller" Progression with Roman Numerals in Major and Relative Minor

Whether you hear this progression in major or minor depends on whether you hear the first chord as the tonic or if you hear the third and fourth chord as tonic and dominant.

Here is an example with the IV–I–V–vi progression.

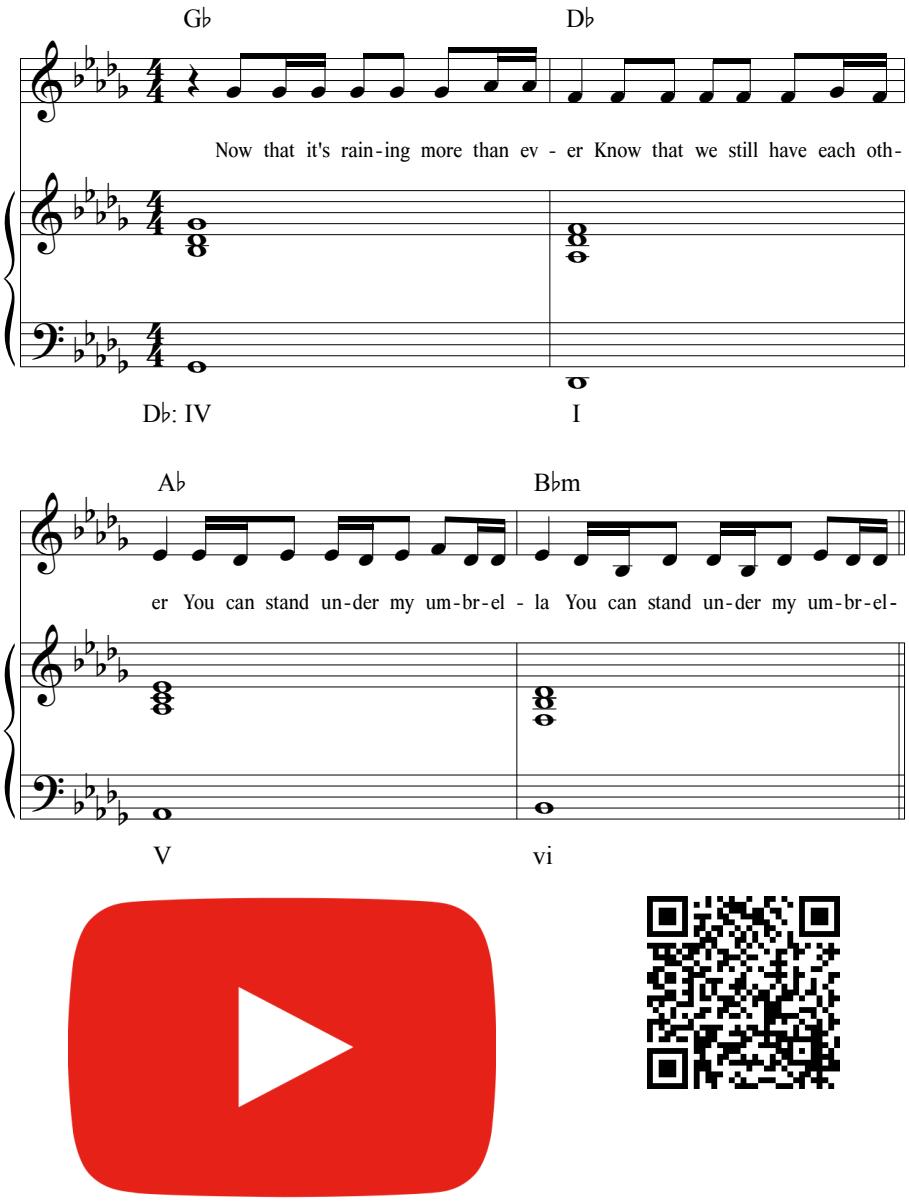


Figure 9.7.6 Christopher Stewart, Terius Nash, Kuk Harrell, Shawn Carter, "Umbrella" (2007)

9.8 The i–VII–VI–VII Progression

The i–VII–VI–VII (Am–G–F–G) progression is similar to the descending $\hat{1}$–$\flat\hat{7}$–$\flat\hat{6}$–$\hat{5}$ bass line of the "Andalusian progression" (Am–G–F–E) in flamenco music, with the exception of the last bass note or chord.

Here are examples of the i–VII–VI–VII progression.

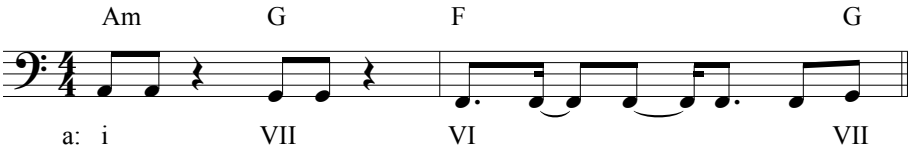


Figure 9.8.1 Jimmy Page and Robert Plant, "Stairway to Heaven" (chords and bass line only) (1970)

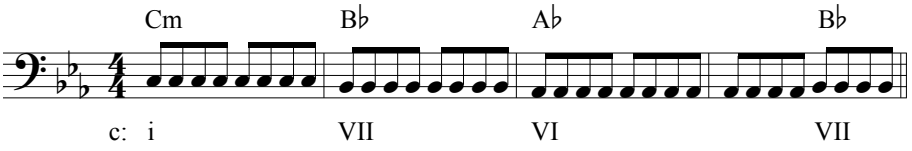


Figure 9.8.2 Adele Adkins and Paul Epworth, "Rolling In The Deep" (chords and bass line only) (2010)

The i–VII–VI–VII progression can also be rotated to become VI–VII–i–VII.

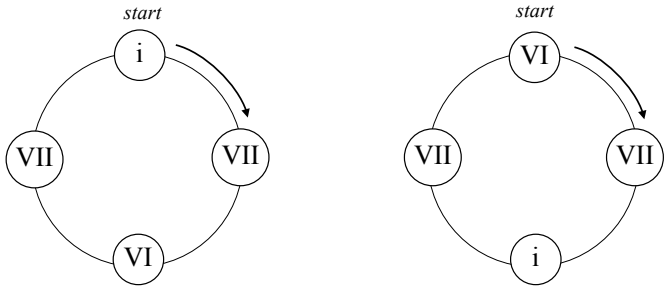


Figure 9.8.3 The i–VII–VI–VII progression rotating to VI–VII–i–VII

In some cases, the fourth chord is eliminated. In that case, VI–VII–i–VII becomes VI–VII–i–i, as in the following examples.

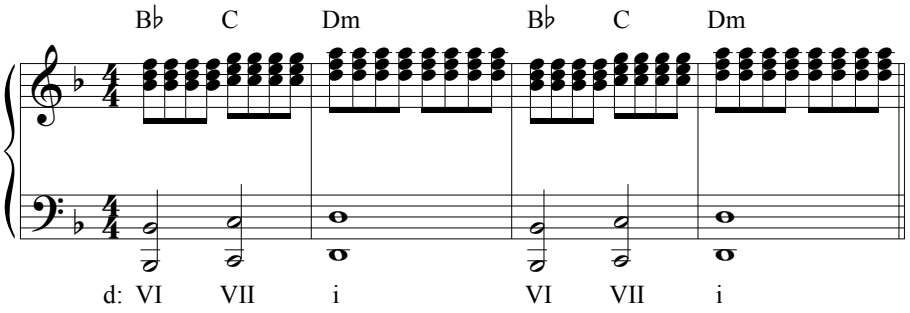


Figure 9.8.4 Christopher Bridges, Calvin Broadus, Johnny Mollings, Lenny Mollings, William Roberts II, "All I Do Is Win" (chords and bass line) (2010)

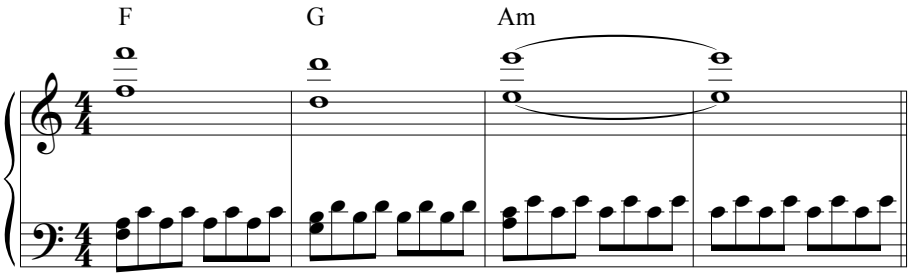


Figure 9.8.5 Philip Glass, Metamorphosis Two (1989)

The i–VII–VI–VII progression can also be thought of as being in a major key: vi–V–IV–V.

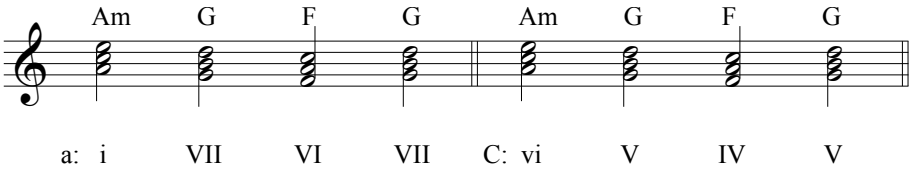


Figure 9.8.6 The same progression viewed from minor and relative major

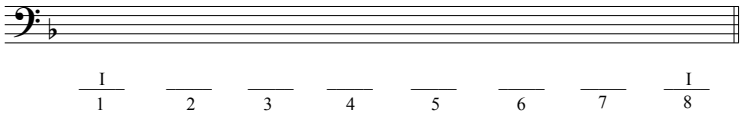
There are several more common harmonic progressions to explore in future chapters dealing with topics like secondary chords, mode mixture, the Neapolitan chord, augmented sixth chords, and jazz harmony.

9.9 Practice Exercises

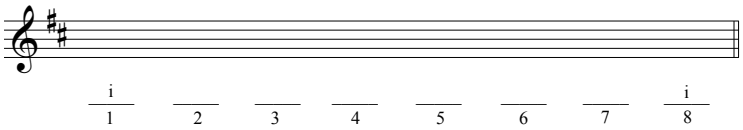
Day One. Day One:

1. Write the circle of fifths progression in the following keys with root position triads. Label Roman numerals below and lead-sheet symbols above.

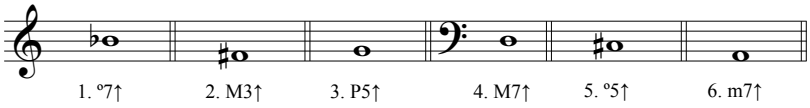
(a) In F major:



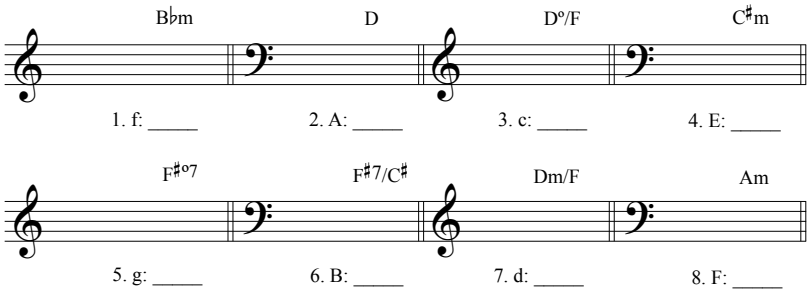
(b) In B minor:



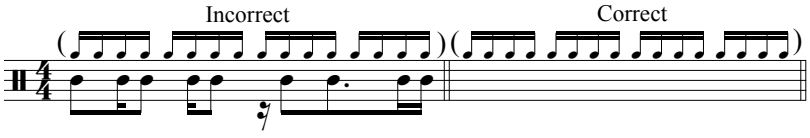
2. Review. Write the following intervals above the given note.



3. Review. Given the lead-sheet symbol and key, write the key signature, triad or seventh chord, and Roman numeral.



4. Review. Correct the rhythmic notation of the following example.

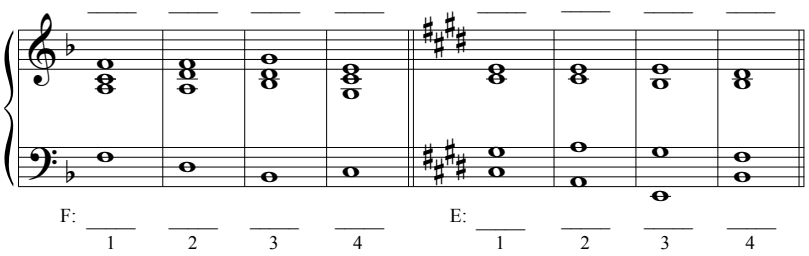


Exercise Group. Day Two:

5. For each cadence, label the chord(s) involved.

Half Cadence = ____
Deceptive Cadence = ____ ____
Plagal Cadence = ____ ____
Authentic Cadence = ____ ____

6. Analyze the following progressions with lead-sheet symbols above and Roman numerals below.



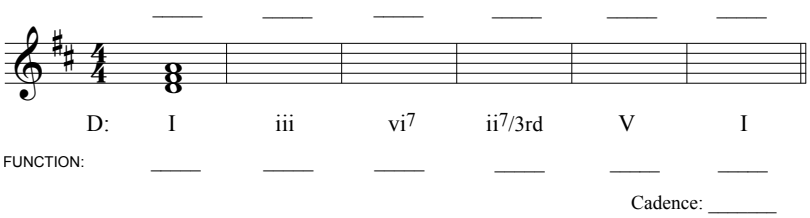
7. For the progression, do the following:

(a) Given the Roman numerals, write the triads or seventh chords

(b) Analyze the harmonies with lead-sheet symbols above the staff

(c) Analyze the harmonic function of each harmony using the abbreviations "ton." for tonic function, "dom." for dominant function, "pre-dom." for pre-dominant function, and "ton. prol." for tonic prolongation function

(d) Specify the cadence that ends the progression



Click here to download the first homework assignment for this chapter.
Click here to download the second homework assignment for this chapter.

Chapter 10

Non-Chord Tones

10.1 Introduction to Non-Chord Tones

Non-chord tones are notes that do not belong to the chord. Sometimes referred to as "embellishing tones" and "non-harmonic tones," non-chord tones are classified by how they are approached and left (either by same tone, step, or leap).

There are nine types of non-chord tones.

Table 10.1.1

Non-Chord Tone	*Approached by*	*Left by*
Passing Tone	step	step in same direction
Neighbor Tone	step	step in opposite direction
Appoggiatura	leap	step
Escape Tone	step	leap in opposite direction
Double Neighbor	see text	see text
Anticipation	step	same note
Pedal Point	same note	same note
Suspension	same note	step down
Retardation	same note	step up

The following qualifiers can be applied to non-chord tones:

- Accented—occurring on the beat
- Unaccented—occurring on the weak part of the beat (on the offbeat)
- Chromatic—not belonging to the key
- Metrical—equal to the duration of the beat
- Sub-metrical—smaller than the beat
- Super-metrical—larger than the beat

10.2 Passing Tones

Passing tones are notes that pass between chord tones.

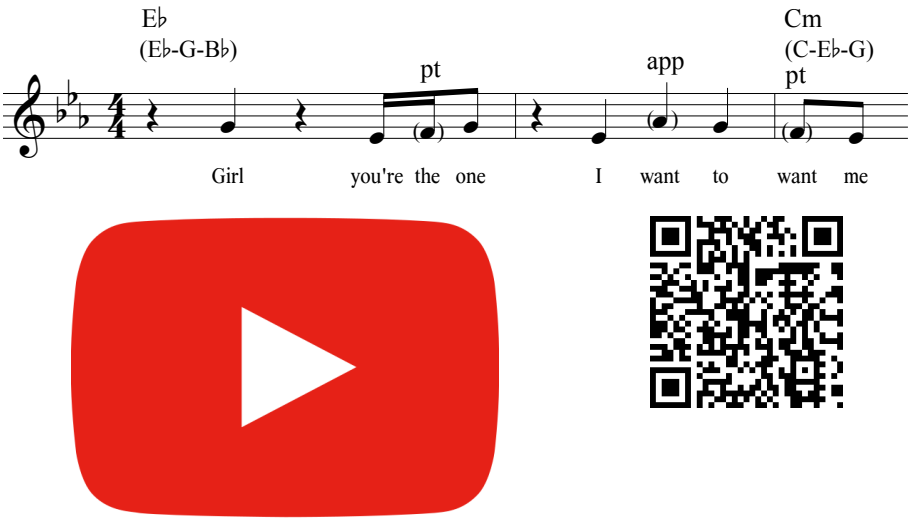


Figure 10.2.1 Jason Desrouleaux, Ian Kirkpatrick, Samuel Denison Martin, Lindy Robbins, Mitch Allan, "Want to Want Me" (2015)

In the first bar of the "Want to Want Me" example, the passing tone is unaccented. In the third bar, it is accented (on the beat). The non-chord tone in bar 2 is an appoggiatura.

There can be two consecutive diatonic passing tones in a descending scale segment from the root and fifth of a chord.

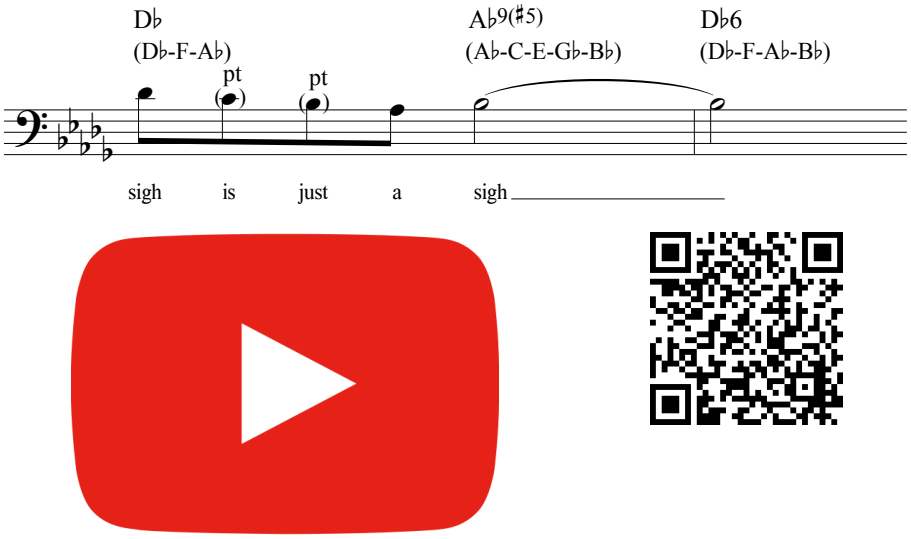


Figure 10.2.2 Herman Hupfeld, "As Time Goes By" (1931)

Here is an example with chromatic passing tones.

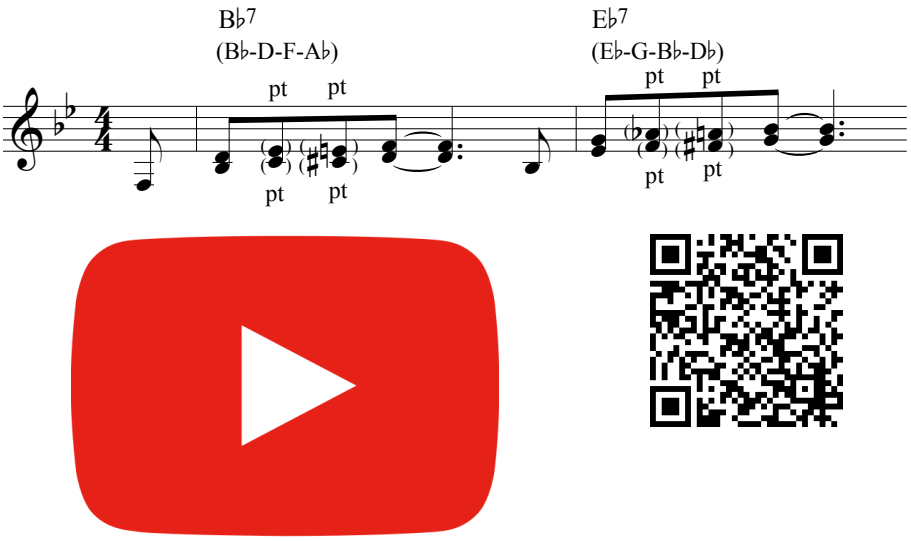


Figure 10.2.3 Thelonious Monk, "Blue Monk" (1954)

In the next section we discuss the neighbor tone.

10.3 Neighbor Tones

Neighbor tones move away from a note by step then return to the note.

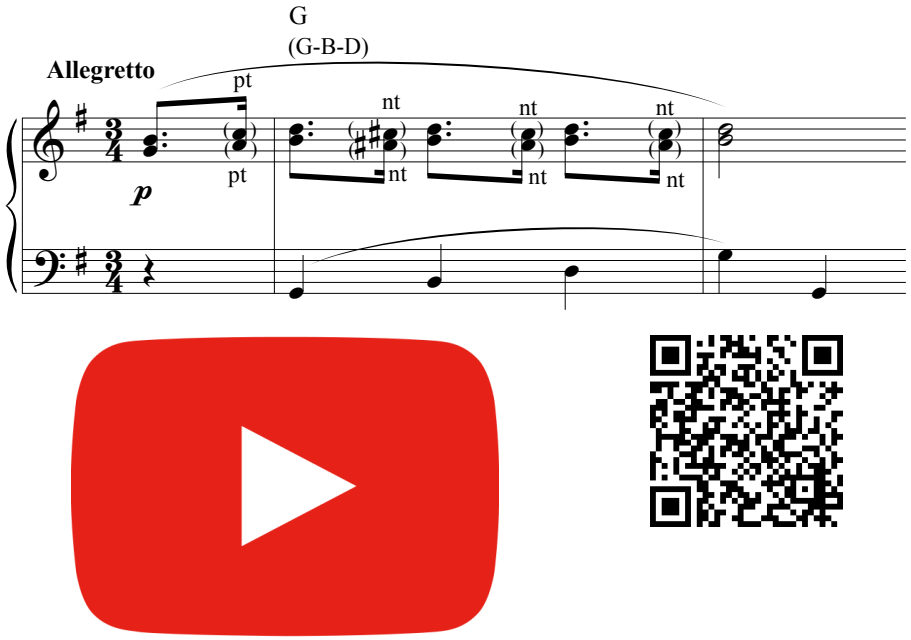


Figure 10.3.1 Ludwig van Beethoven, Minuet in G, WoO 10, No. 2

In the next section we discuss the appoggiatura.

10.4 Appoggiatura

The **appoggiatura** is approached by leap and left by step. It is usually accented (on the beat), which makes it a particularly expressive non-chord tone.

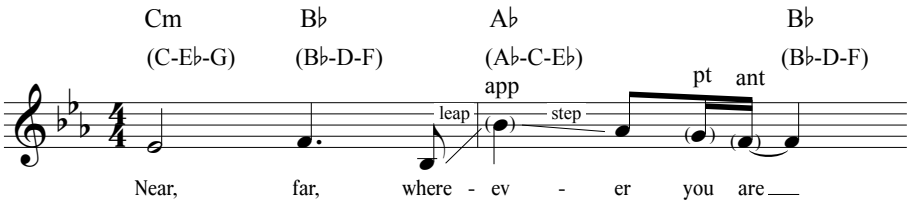


Figure 10.4.1 James Horner and Will Jennings, "My Heart Will Go On" (1997)

The example above also has an anticipation, which is discussed in a later section in this chapter.

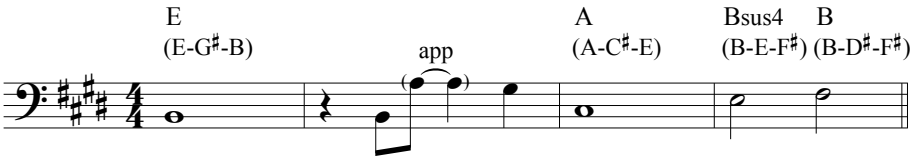


Figure 10.4.2 Bruce Springsteen, "Born to Run" (1975)

Notice that both the appoggiaturas in the following example resolve up. Both the leap to and step away from any appoggiatura can be from any direction.

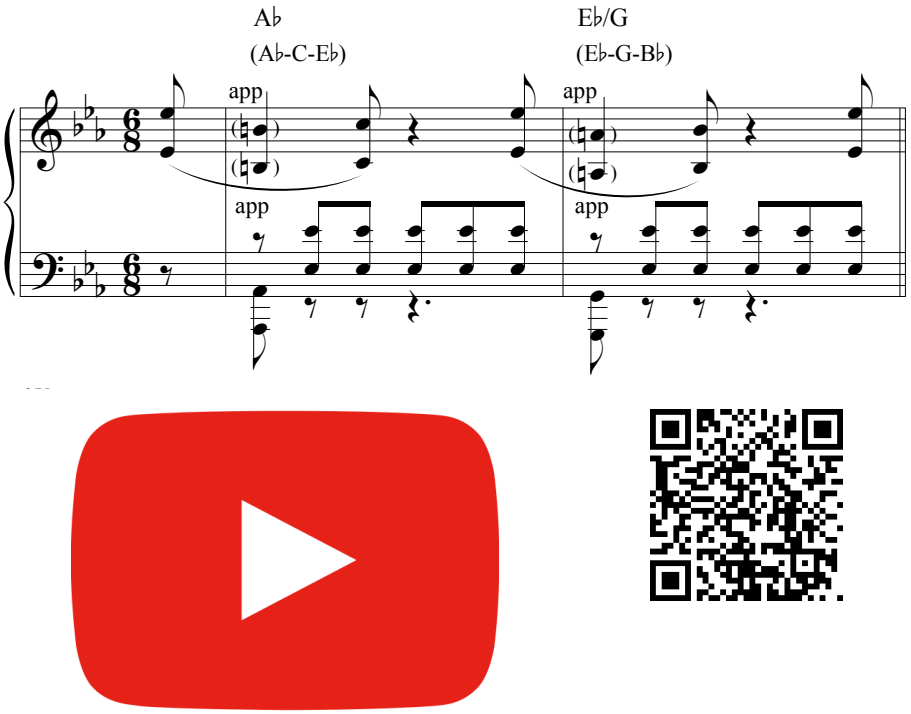


Figure 10.4.3 W.A. Mozart, Symphony No. 40, K. 550, II

In the next section we discuss the escape tone.

10.5 Escape Tone

An **escape tone** is approached by step and left by leap in the opposite direction. An easy example to remember is the end of the "Star-Spangled Banner." The word "of" in "home *of* the brave" is an escape tone.

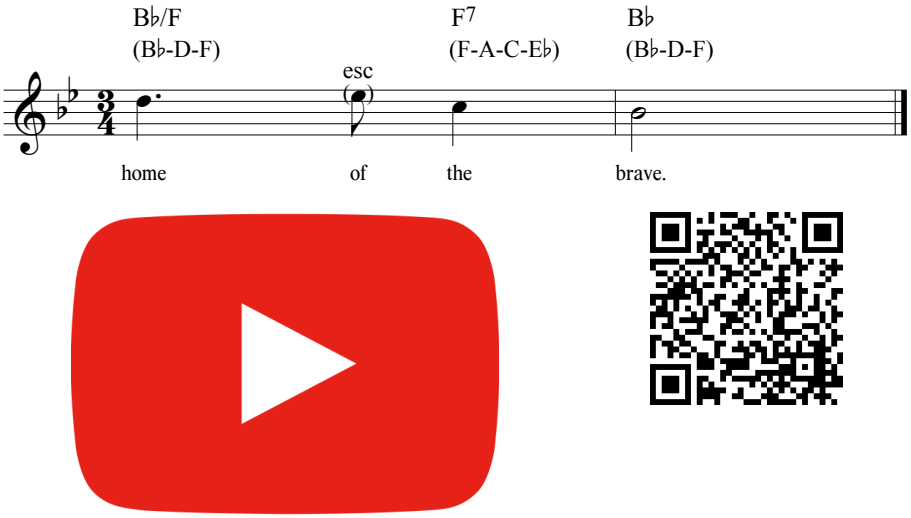


Figure 10.5.1 Francis Scott Key and John Smith, "Star-Spangled Banner" (1814)

Here is another example, with escape tones used in a melodic sequence.

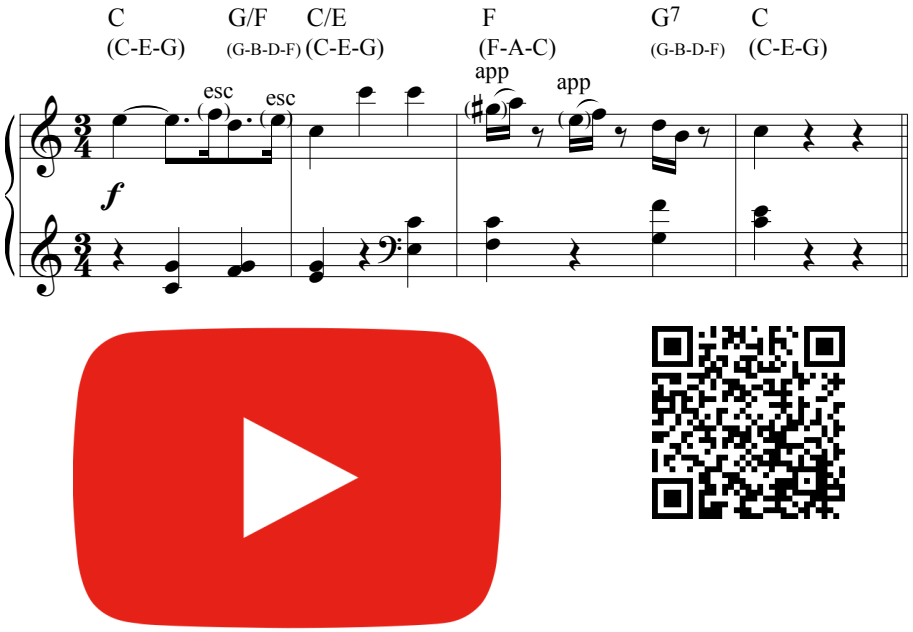


Figure 10.5.2 Joseph Haydn, Piano Sonata in C Major, Hob. XVI:35, III (1780)

Here is an example of an escape tone in popular music.

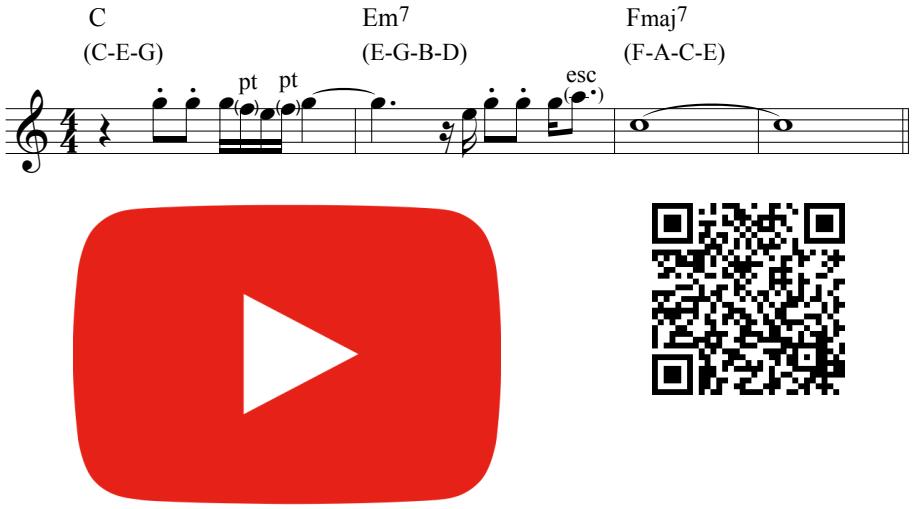


Figure 10.5.3 Paul McCartney and Linda McCartney, "Silly Love Songs" (1976)

10.6 Double Neighbor

The **double neighbor** (sometimes called a "neighbor group") occurs when both the upper and lower neighbor occur before the return to the starting tone.

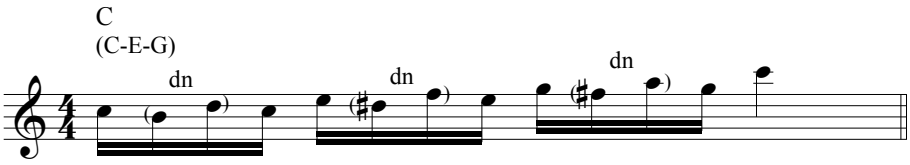


Figure 10.6.1 C major arpeggio embellished with double neighbors

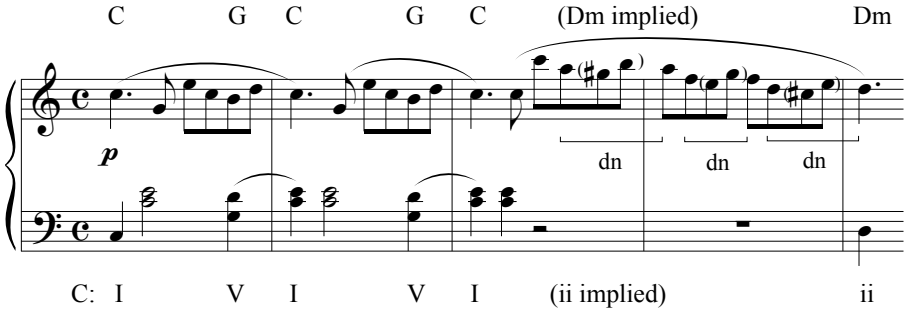


Figure 10.6.2 Friedrich Kuhlau, Sonatina in C Major, Op. 55, No. 1, I (1823)

The double neighbor is sometimes confused with escape tones and appoggiaturas. Be sure to keep track of chord tones when analyzing non-chord tones. Look at the next example and ask yourself how you would analyze the harmony and non-chord tones on beat 4 of the first measure.

Figure 10.6.3 W.A. Mozart, Piano Sonata K. 333, I (1784)

In the next section we discuss the anticipation.

10.7 Anticipation

An **anticipation** is a non-chord tone that anticipates the arrival of the next chord and is often found at cadences, as in the next example.

Figure 10.7.1 George Frideric Handel, *Rinaldo*, "Lascia ch'io pianga" (1711)

Here is an example of an anticipation in popular music.

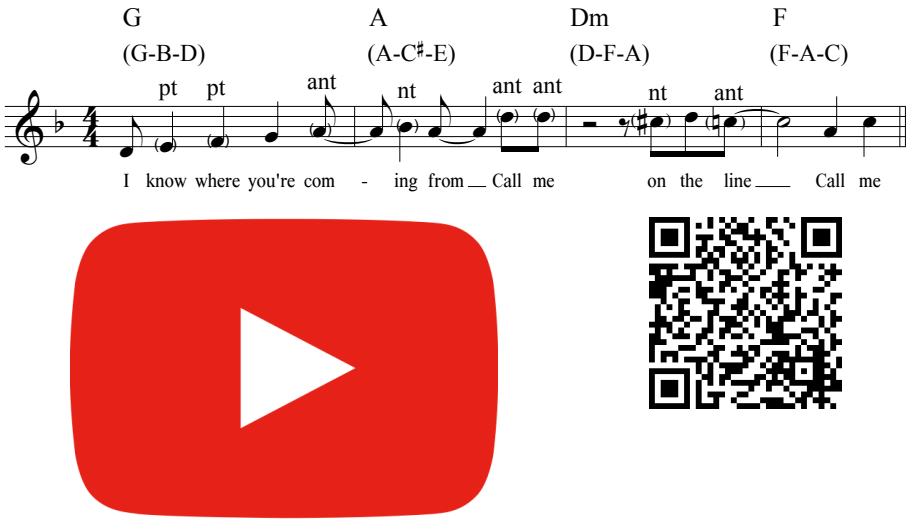


Figure 10.7.2 Debbie Harry and Giorgio Moroder, "Call Me" (1980)

Sometimes syncopation (Definition 4.6.1) will lead to an anticipation of a note in a chord in the following measure, as occurs at the ends of bars 1, 2, and 3 of the "Call Me" example.

10.8 Pedal Point

A **pedal point** is a note that is held through changing harmonies, starting as a chord tone before becoming a non-chord tone. Pedal points are often in the

bass voice (the term "pedal" relates to the foot pedals on an organ).

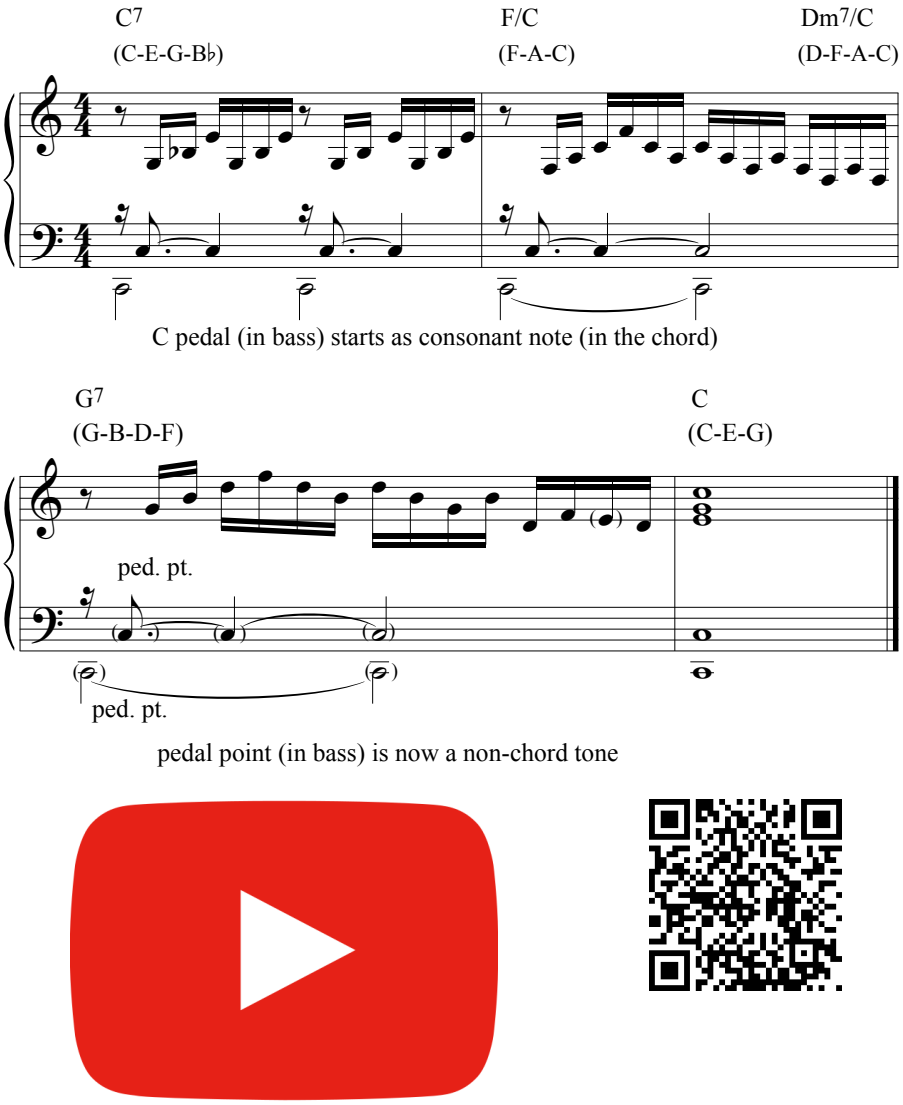


Figure 10.8.1 Bach, J.S., *Well-Tempered Clavier, Book I*, Prelude 1 in C major BWV 846 (1722)

Here is an example from the Romantic era.

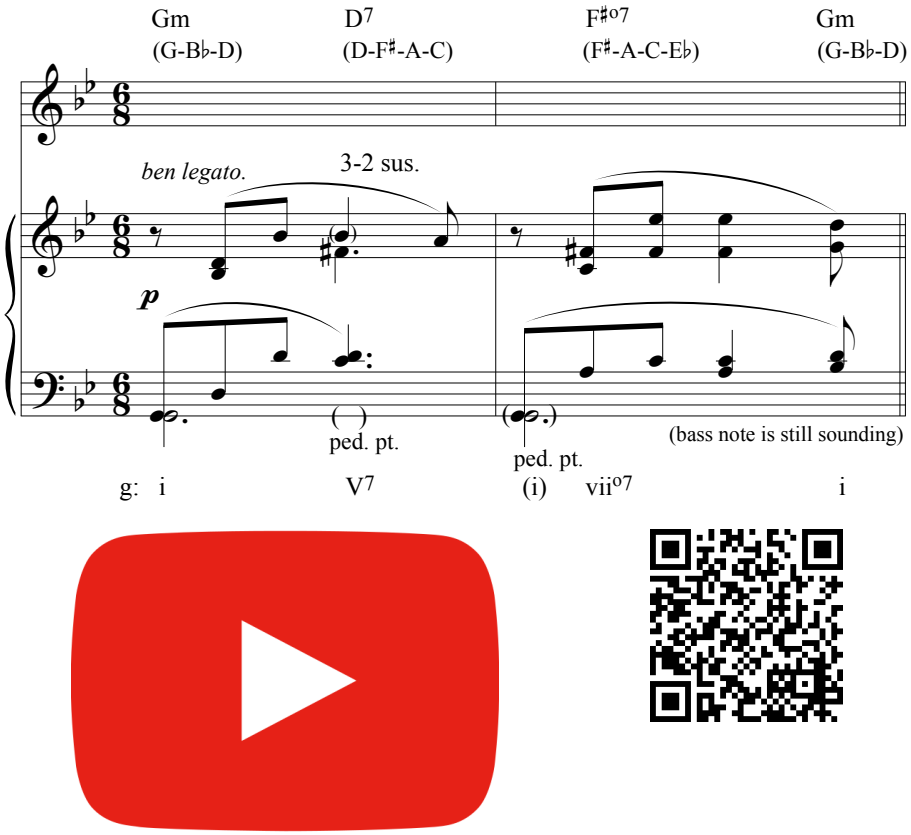


Figure 10.8.2 Clara Schumann, Op. 13, No. 2, "Sie liebten sich beide" (1844)

The Clara Schumann example above also has a suspension ("3-2 sus."); suspensions are discussed in the next section.

When a pedal point is in the bass, it is not necessary to specify the inversion of the chord because the bass pedal point obscures the inversion.

You might also encounter a pedal point in a higher voice, as well as a "double pedal point," where two notes (often a fifth apart) act as pedal points.

10.9 Suspension

Suspensions are accented non-chord tones occurring on downbeats. A **suspension** is approached by the same note and resolves down by step. A suspension is made up of a preparation, suspension, and resolution. Sometimes the preparation is tied to the suspension.

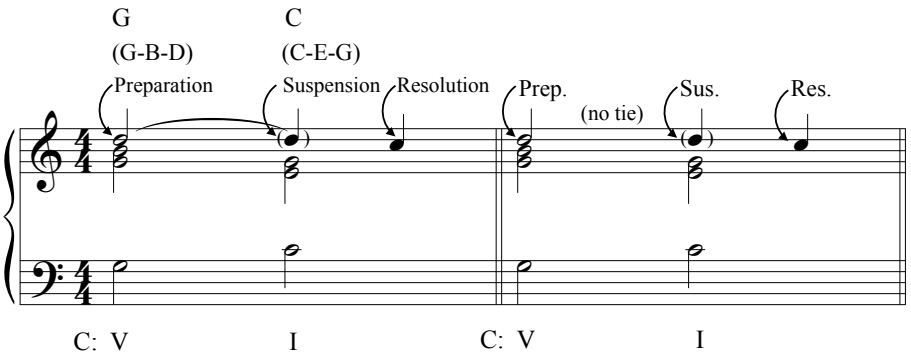


Figure 10.9.1 Introductory Suspension example with and without tie

Suspensions are classified by numbers (9-8, 7-6, 4-3, 2-3, and sometimes 6-5) that specify the interval distance of the suspended note and its resolution to the bass note

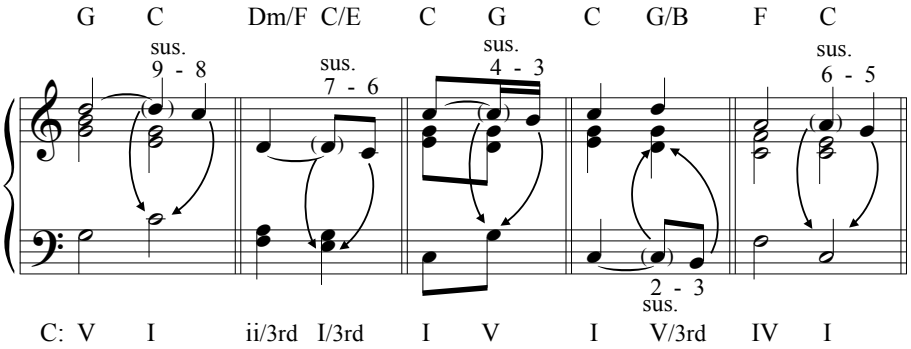


Figure 10.9.2 Examples of the 9-8, 7-6, 4-3, 2-3, and 6-5 suspensions

In the example above, the notes in the 4-3 suspension are an 11th and 10th higher than the bass. Reduce all intervals larger than an octave to the numbers 7-6, 4-3, and 6-5.

Here is an example with a 4-3 suspension.

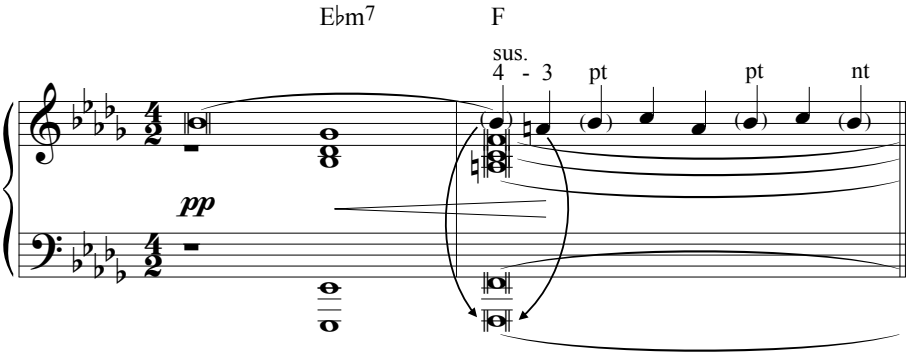


Figure 10.9.3 Samuel Barber, *Adagio for Strings* (1936)

Here is an example with 7-6 and 9-8 suspensions.

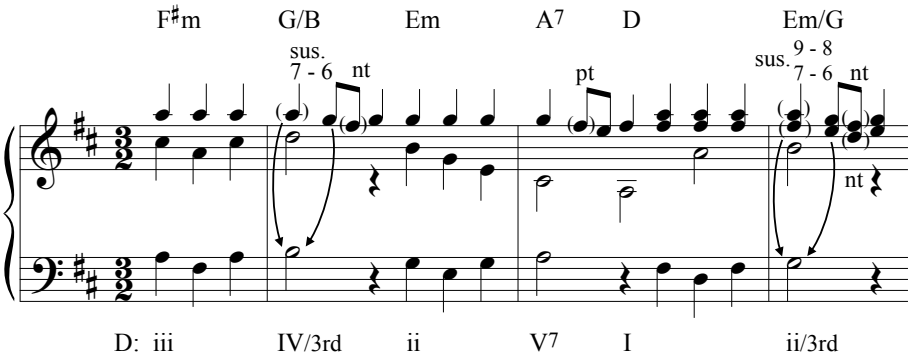


Figure 10.9.4 George Frideric Handel, Suite No. 2 in D Major, HWV 349: II. Alla Hornpipe (1717)

The 2-3 suspension is the "bass suspension" and is measured against an upper voice. Again, you may encounter the literal intervals 10-9 but should label the suspension as 2-3.

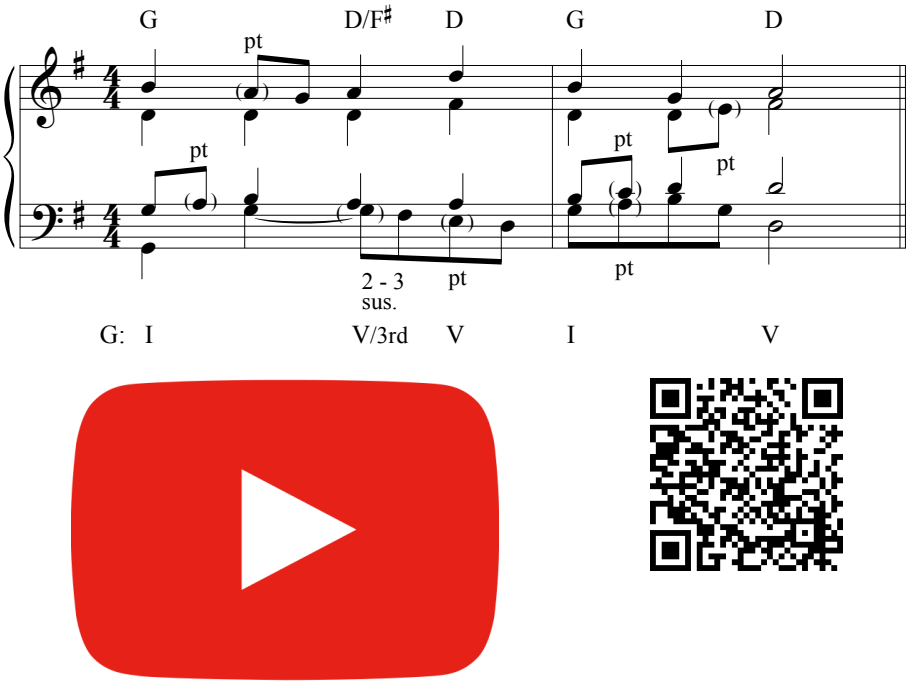


Figure 10.9.5 Bach, J.S., Chorale 238, "Liebster Jesu, wir sind hier," BWV 373

When a chord is inverted, you will sometimes encounter non-standard suspension numbers like 5-4 or 3-2.

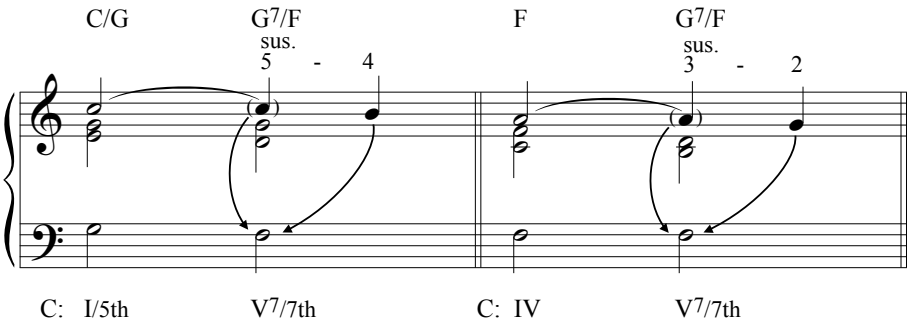


Figure 10.9.6 Non-standard suspension numbers because of inverted chords

You will sometimes encounter decorations of suspensions where other notes occur before the resolution, as in the following example.

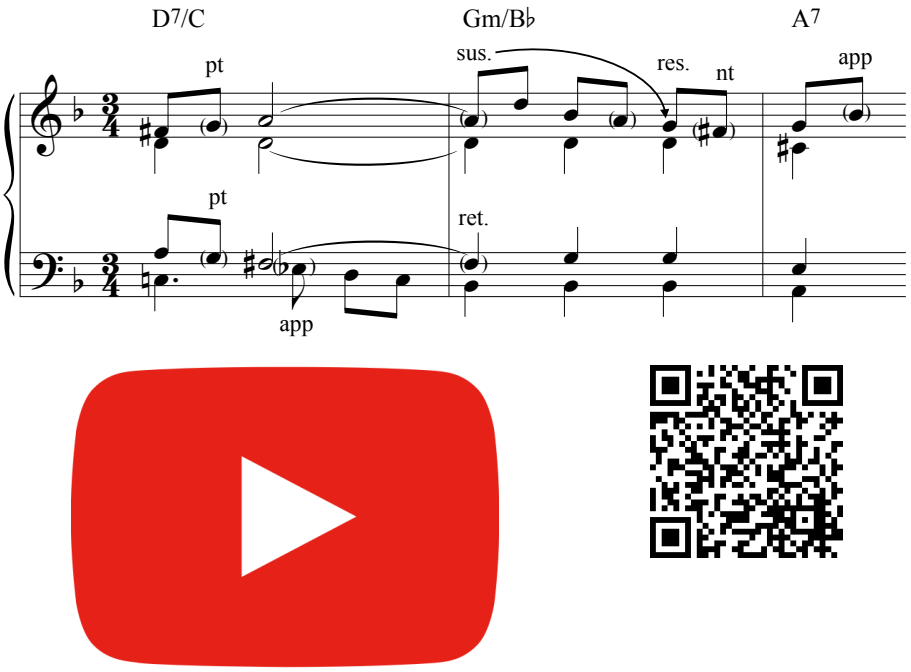


Figure 10.9.7 Bach, J.S., French Suite No. 1 in D Minor, BWV 812, Sarabande (1722)

The "ret." in the tenor part in the second measure is a retardation, which is covered in the next section.

10.10 Retardation

A **retardation** is usually an accented non-chord tone, meaning it occurs on a downbeat. A retardation is approached by the same note and resolves up by step.

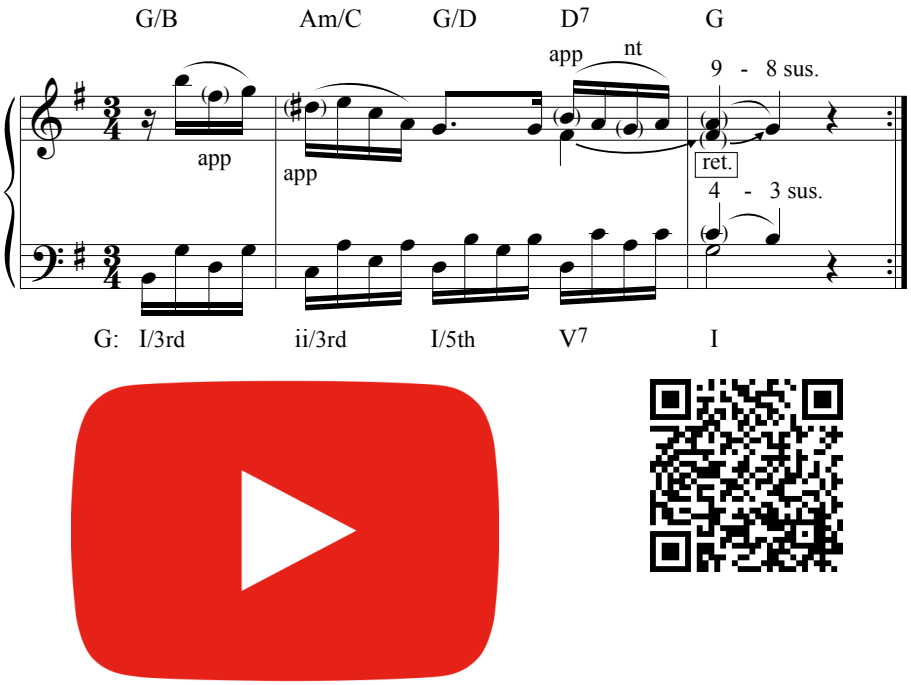


Figure 10.10.1 W.A. Mozart, Piano Sonata in C major, K. 545, II (1788)

Classical composers like Mozart often used retardations and suspensions at cadences in slow movements.

10.11 Incomplete Neighbor

Because composers are notorious for "breaking the rules," you will encounter examples in the real world that either defy explanation or have multiple valid explanations. One "utility" non-chord tone is the incomplete neighbor.

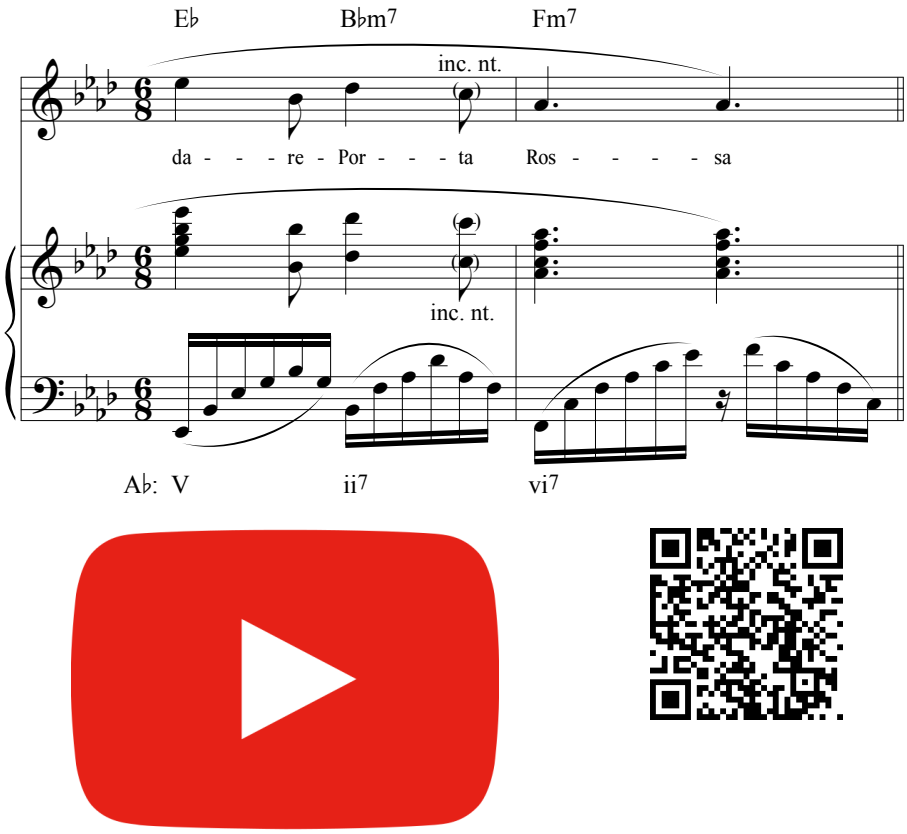


Figure 10.11.1 Giacomo Puccini, *Gianni Schicchi*, "O mio babbino caro" (1918)

You may also find incomplete double neighbor figures, especially in late Romantic music and jazz. Keep an open mind when analyzing music.

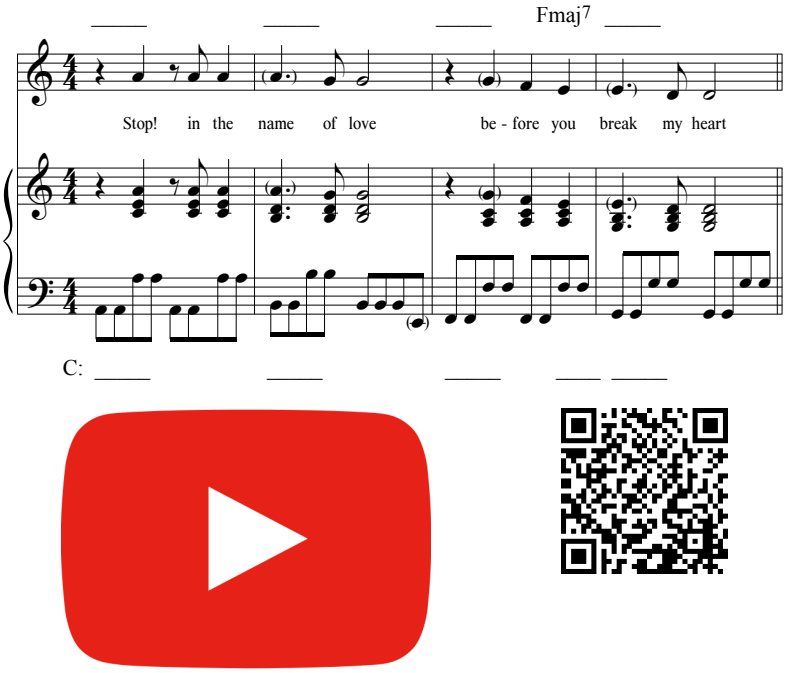
10.12 Practice Exercises

1. Fill in the blanks in the following table.

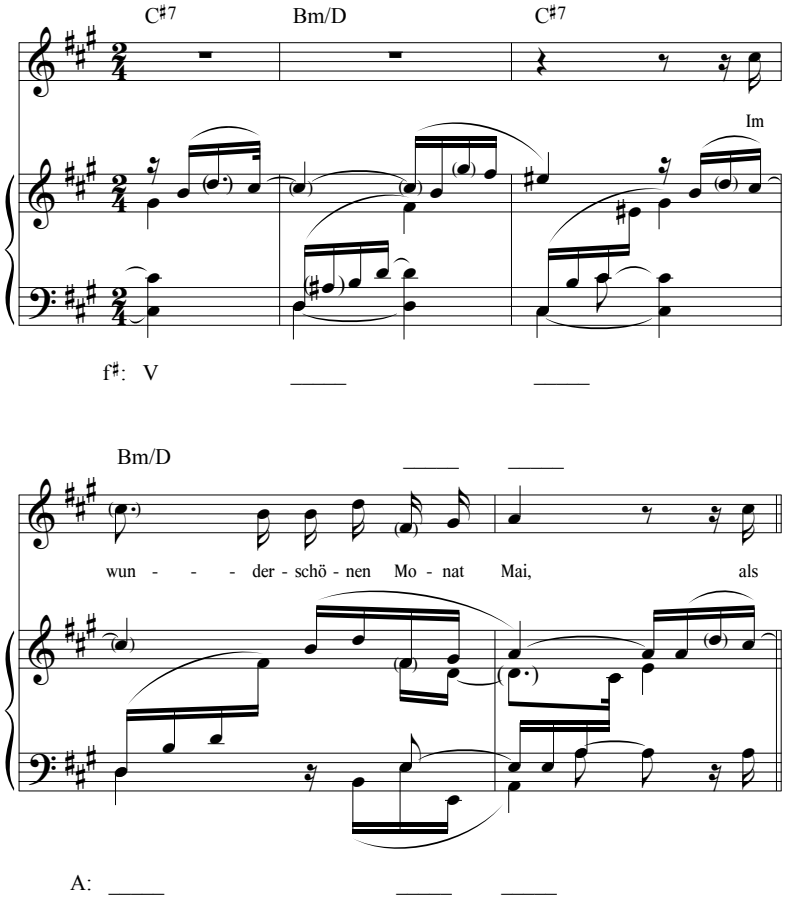
Non-Chord Tone Type	*Approached by*	*Left by*
	same tone	step up
		leap in opposite direction
	step	step in same direction
	leap	

2. Analyze the harmonies with lead-sheet symbols above the staff and Roman numerals below, then analyze the non-chord tones.

(a) Brian Holland, Lamont Dozier, Eddie Holland, "Stop! In the Name of Love" (1965)



(b) Robert Schumann, *Dichterliebe*, Op. 48, 1. "Im wunderschönen Monat Mai" (1840)



Click here to download the homework.

Chapter 11

Melodic Analysis

We will divide analysis of melodies into motives (which can be broken into fragments) and phrases (which can be broken into subphrases) in order to understand the construction of melodies. We will discuss periods and sentences in another chapter.

11.1 Motive

A **motive** (or motif) is the smallest identifiable melodic idea in music. However, we will find times when it will be necessary to discuss a smaller fragment (called a "germ" by some authors) from a motive.

In the following example from the first movement of Beethoven's Symphony No. 1, we find four motives within the first four measures of the primary theme.

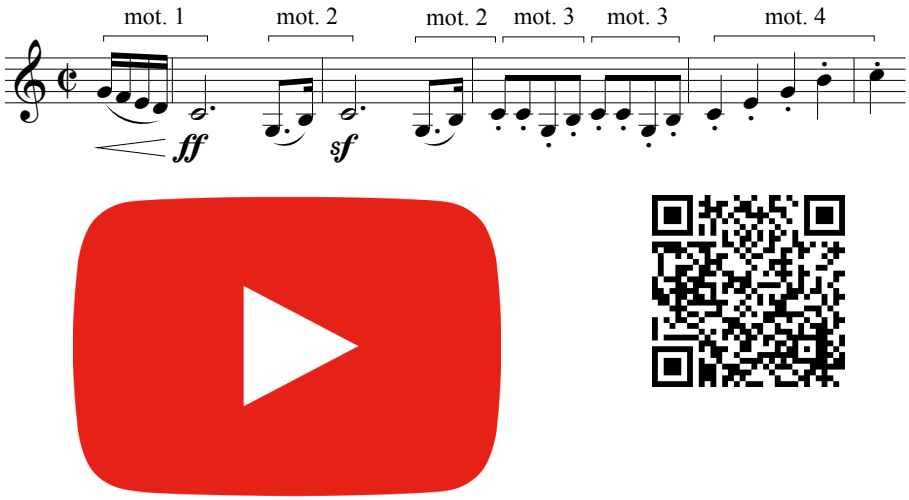


Figure 11.1.1 Ludwig van Beethoven, Symphony No. 1, Op. 21, I, Motives in Primary Theme (1800)

Later in the movement we find Beethoven extracting motives from this four-measure phrase in order to develop them through sequences (Definition 9.1.11).

Here is development of motive 1.

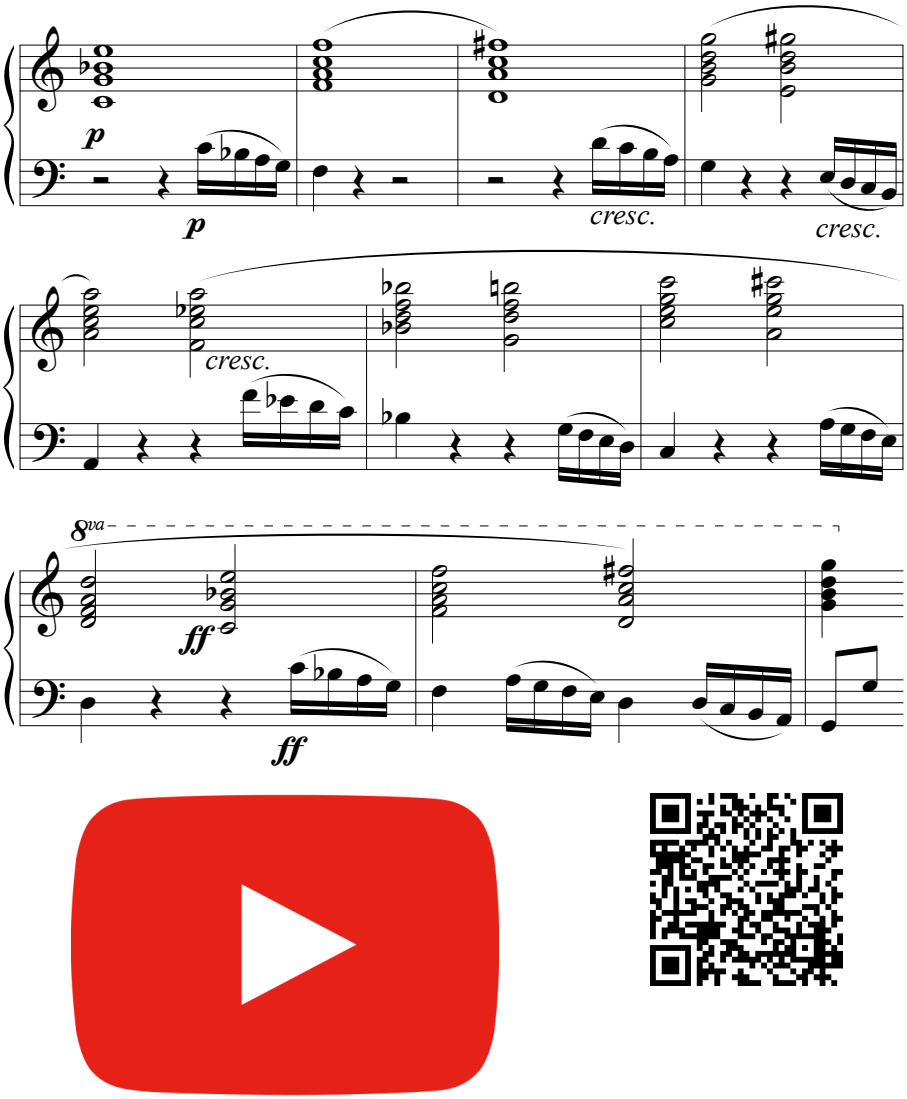


Figure 11.1.2 Beethoven, Symphony No. 1, I, development of motive 1

Here is development of motive 2

Figure 11.1.3 Beethoven, Symphony No. 1, I, development of motive 2

Here is development of motives 2 and 3 together.

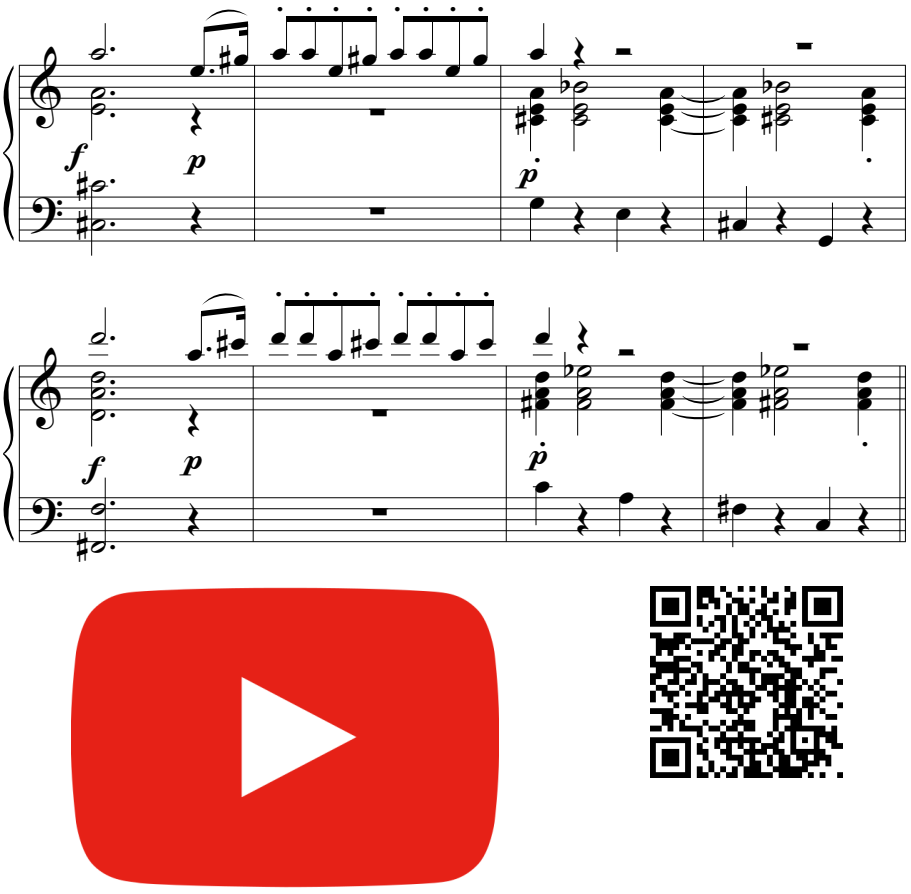
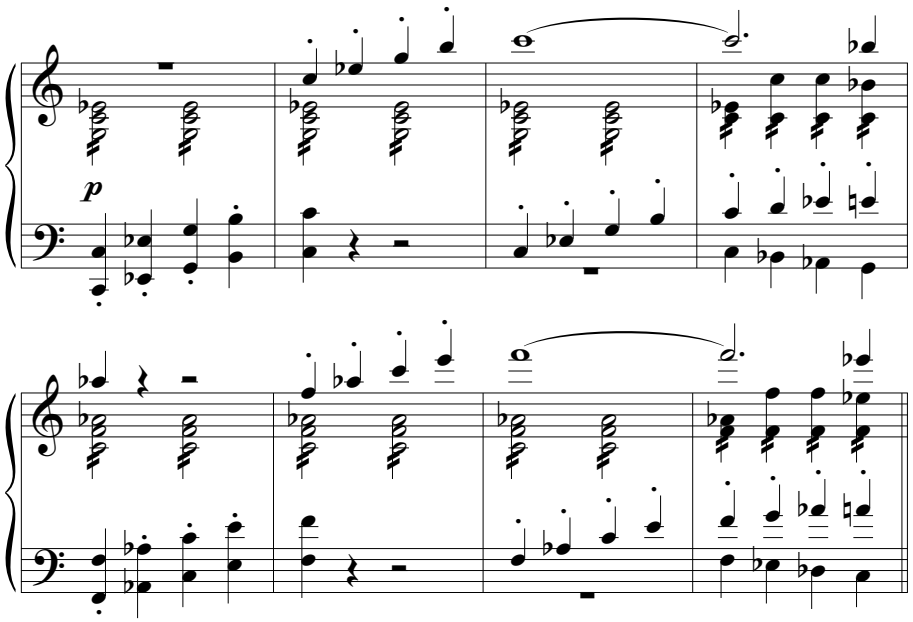


Figure 11.1.4 Beethoven, Symphony No. 1, I, development of motives 2 and 3

The previous excerpt leads directly into the next, which features development

of motive 4.



In the next section, we will look at some of the various ways one can alter a melody

Figure 11.1.5 Beethoven, Symphony No. 1, I, development of motive 4

11.2 Melodic Alteration

While there are more than a dozen ways to alter a melody, we will focus on seven methods of basic melodic alteration at this point of the text.

11.2.1 Inversion

Inversion as applied to music means an idea is exactly upside-down or "mirrored" across a horizontal plane, like mountains reflected in a lake.

First, listen to the following example.

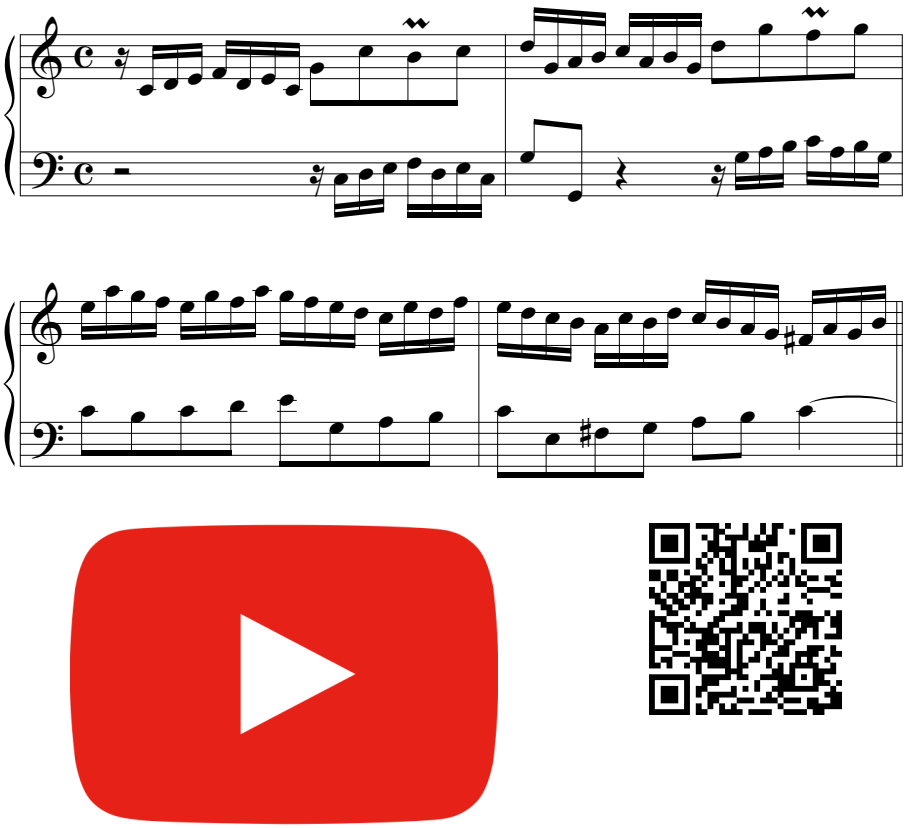


Figure 11.2.1 Bach, Invention No. 1 in C Major, BWV 772 (1723)

The first seven notes in measure 1 are inverted in measure 3, shown in the following example.

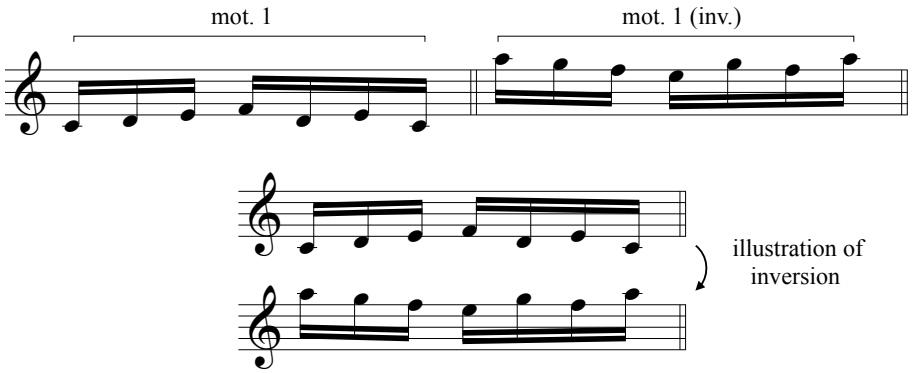


Figure 11.2.2 Melodic inversion in Invention No. 1 in C Major by J.S. Bach

Melodic inversion can be *real* (where every interval is exactly the same quality) or *tonal* (where the intervals abide by the scale or key). For the majority of this text, we will encounter tonal inversion until we discuss techniques of 20th- and 21st-century music in the final chapters of this text.

11.2.2 Intervallic Change

Intervallic change is less exact than inversion. With **intervallic change**, the rhythm is generally intact and the motive relates to a previous iteration, but

some of the intervals are different.

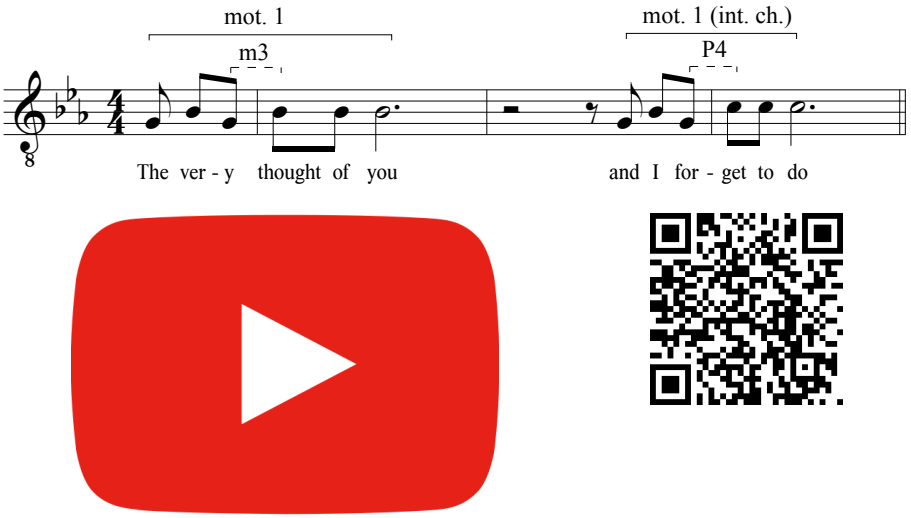


Figure 11.2.3 Ray Noble, "The Very Thought of You" (1934)

The next example has two intervals changed, one of which includes a change in contour.

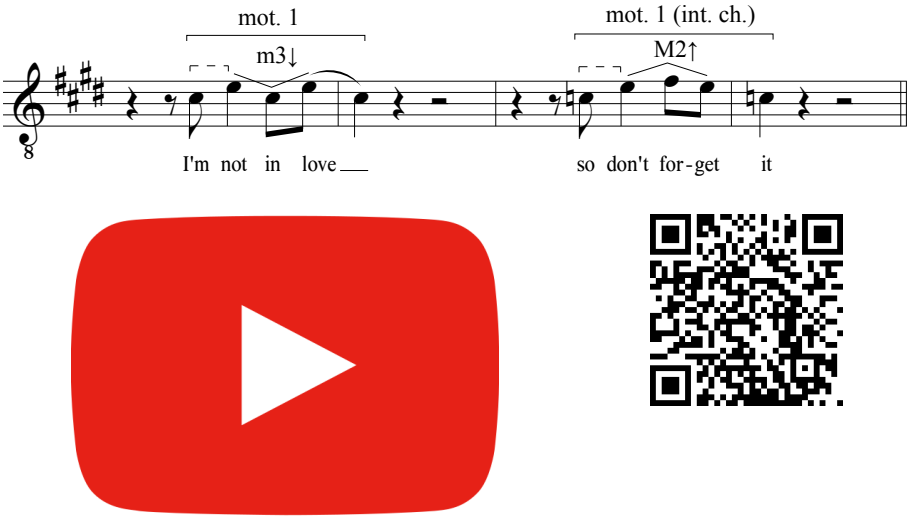


Figure 11.2.4 Eric Stewart and Graham Gouldman, "I'm Not In Love" (1975)

11.2.3 Augmentation and Diminution

Augmentation usually refers to an exact doubling of the duration of every rhythmic value in a motive or phrase.

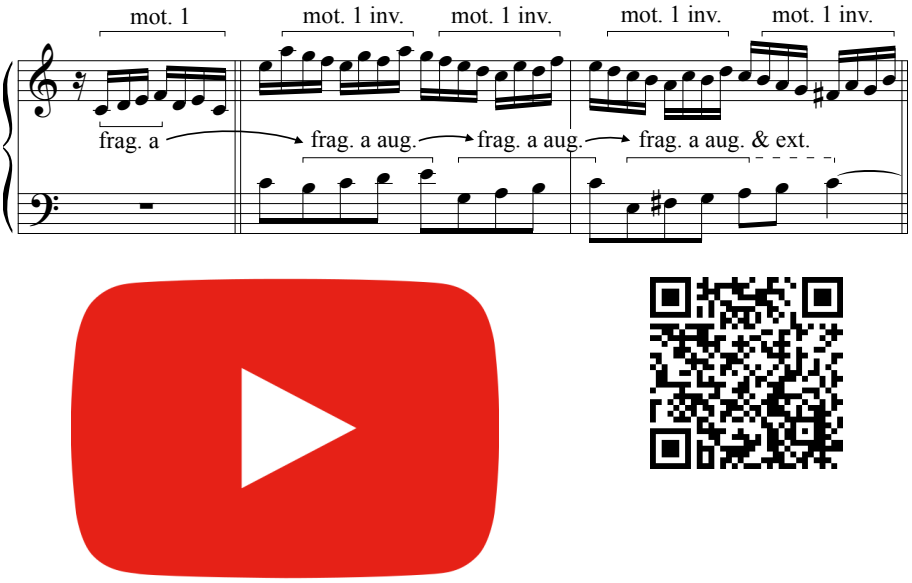


Figure 11.2.5 Augmentation of fragment "a" in Invention No. 1 by J.S. Bach

We will discuss extension and fragmentation of motives later in this chapter.

Diminution is the opposite of augmentation and usually refers to the exact halving of the duration of every rhythmic value in a motive or phrase. However, diminution can also refer to the use of shorter rhythmic values, as in the following example.

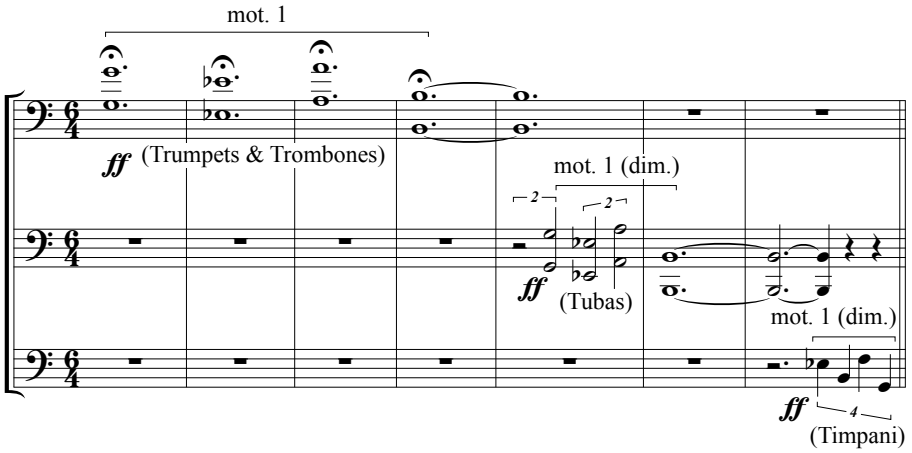


Figure 11.2.6 Diminution of the first four notes in "Uranus" from *The Planets*, Op. 32, by Gustav Holst (1916)

11.2.4 Rhythmic Change

Similar to the inexact nature of intervallic change, label a motive as having **rhythmic change** when some but not all rhythmic values of the motive are varied.

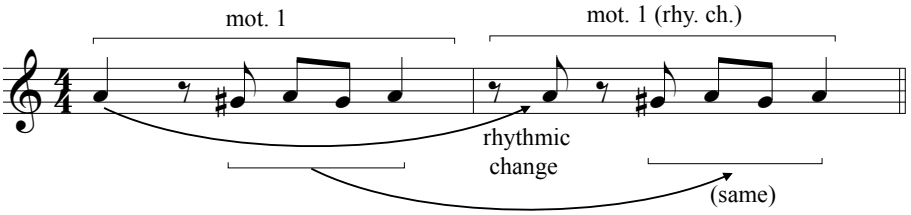


Figure 11.2.7 Hurby Azor and Ray Davies, "Push It" (1987)

Imagine the effect if there had been no rhythmic change and the first measure was merely repeated.

In the next example, from Beethoven's "Pathétique" sonata, motive 1 has dotted rhythms during the introduction of the piece.

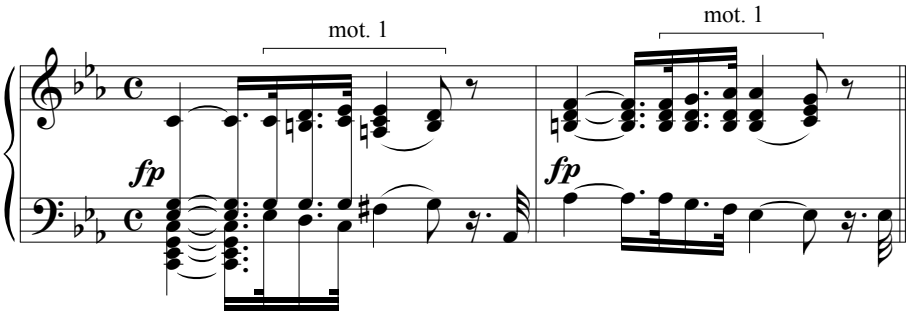


Figure 11.2.8 Beethoven, Pathétique Sonata, Op. 13, I, Introduction (1799)

In the development section, Beethoven changes the rhythm of motive 1 then abbreviates it in the following measure when it is sequenced up a step.

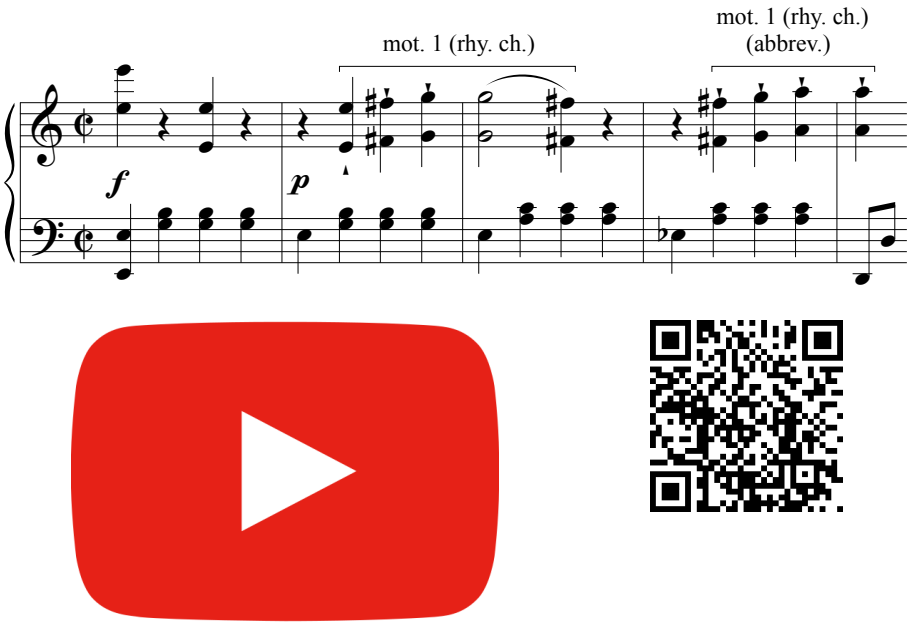


Figure 11.2.9 Beethoven, Pathétique Sonata, Op. 13, I, development section

11.2.5 Ornamentation

Ornamentation means the notes in a motive can be ornamented or embellished with passing tones, neighbor tones, and the other non-chords tones we studied in the previous chapter.

Here is an example of the ornamentation of a 4-note motive.

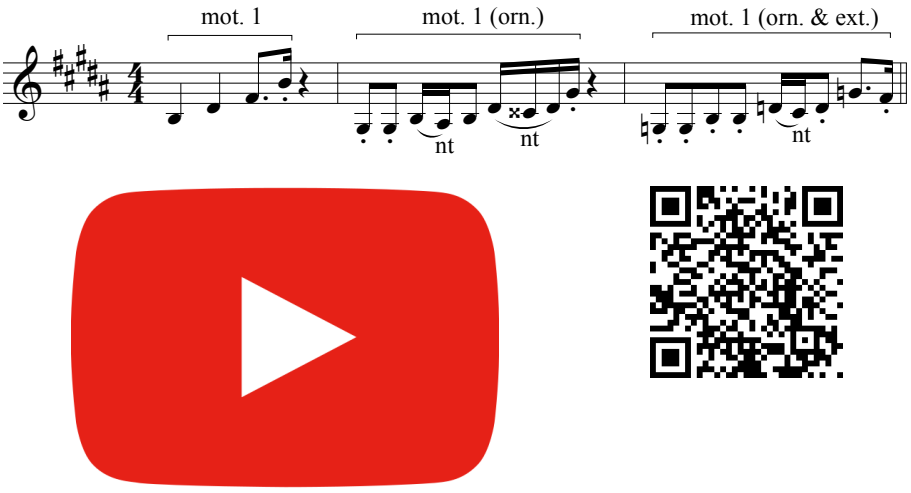


Figure 11.2.10 Stevie Wonder, "Sir Duke" (1976)

11.2.6 Extension

Extension of a motive needs little explanation: additional material is added to the end of a motive upon its repetition or reoccurrence at a later point in a piece.

Refer to the "Sir Duke" example directly above and to the final measure of the J.S. Bach Invention in C Major example in the section on augmentation.

11.2.7 Retrograde

While rare in tonal music, it is worth mentioning **retrograde**, which is an exact reversing of the order of notes, as can be seen in the following example from popular music.

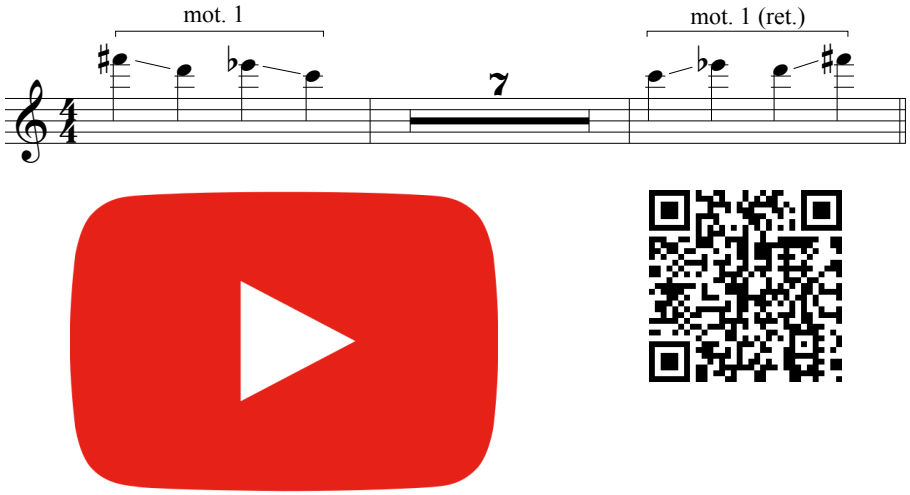


Figure 11.2.11 Melodic Retrograde in "Toxic" by Cathy Dennis, Christian Karlsson, Pontus Winnberg, Henrik Jonback (2003)

We will not consider transposition of a motive (also known as a sequence, see Definition 9.1.11) to be a motivic alteration worth labeling since it is so common.

11.3 Fragment

While the motive is usually defined as the smallest identifiable melodic idea in a composition, "compound" motives can be broken into **fragments** (sometimes called "germs").

In J.S. Bach's Invention 1 in C Major I, the opening 7-note compound motive can be divided into two overlapping four-note fragments that can each be developed independently.

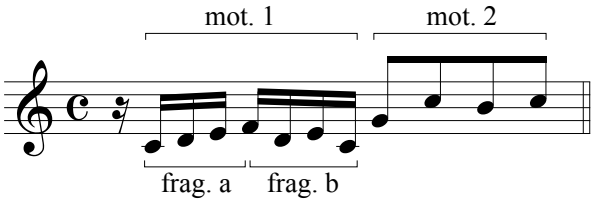


Figure 11.3.1 Fragmentation of motive 1 in C Major Invention

Here again is the example of development (in augmentation) of fragment "a."

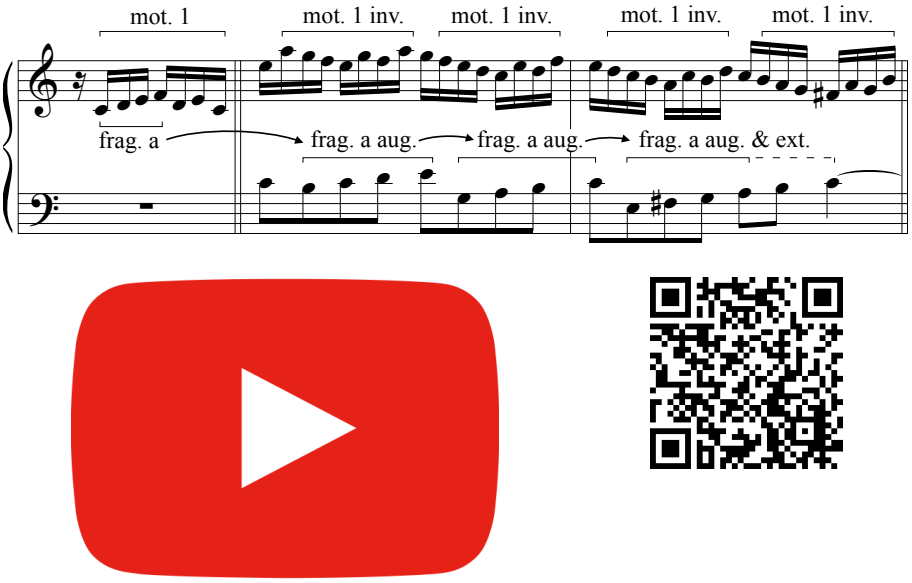


Figure 11.3.2 Development of fragment "a" in Invention 1

In the following example Bach develops an inversion of fragment "b" leading into a cadence in G major.

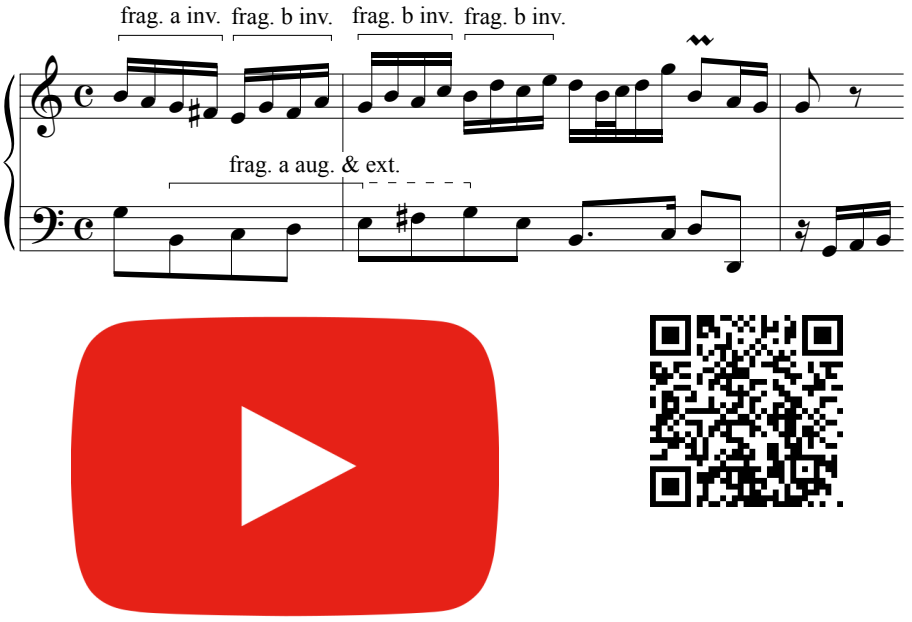


Figure 11.3.3 Development of fragment "b" in Invention 1

11.4 Phrase

Musical form is full of sections, and the **phrase** is the smallest category of section. Unlike a motive, a phrase gives the sense of completing a formal unit.

In classical music, phrases always end with cadences; if you have encountered a cadence, you have just witnessed the completion of a phrase. In popular music, a phrase might be completed by a melody reaching four measures in length or by completing a line of lyric instead of by a cadence.

To generalize (or perhaps over-generalize), most of the phrases you encounter will be four measures in length and will end with one of the four cadence types (authentic cadence, half cadence, deceptive cadence, and, less commonly, the plagal cadence). While four- and eight-measure phrases are the most common, you will also encounter phrases that are five, six, and seven measures in length. Less commonly, you will encounter three-measure phrases.

Here are examples of four-measure phrases. Notice that these phrases have a sense of completion even though they do not end with cadences.

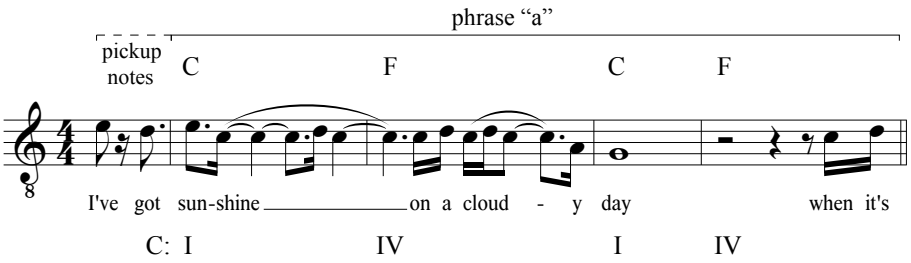


Figure 11.4.1 Smokey Robinson and Ronald White, "My Girl"(1964)

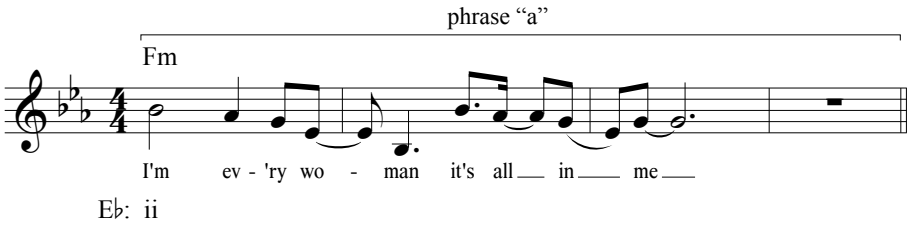


Figure 11.4.2 Nickolas Ashford and Valerie Simpson, "I'm Every Woman" (1978)

Here is an example of a five-measure phrase. Notice that the final chord (a minor iv chord, which will be discussed in the chapter on mode mixture) is part of a half cadence or deceptive cadence, yet the phrase has a feeling of completion, especially considering its relation to the phrases before and after it.

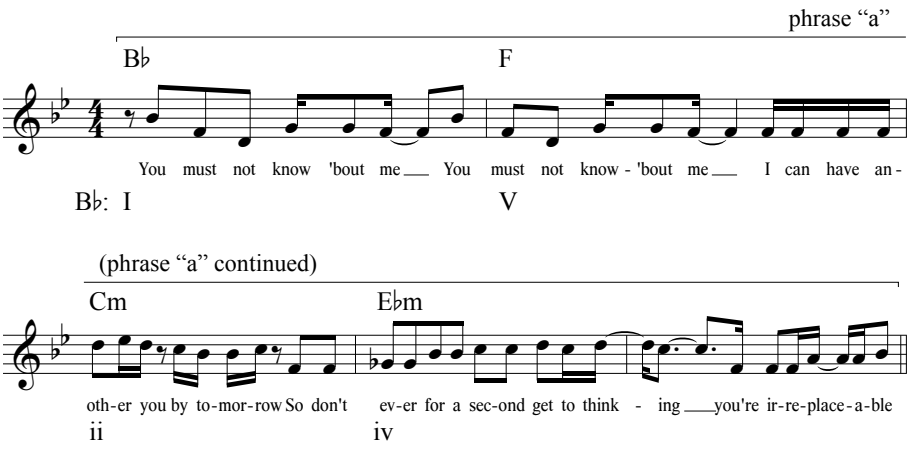


Figure 11.4.3 Shaffer Smith, Mikkel Eriksen, Tor Erik Hermansen, Espen Lind, Beyoncé Knowles, “Irreplaceable” (2006)

Here is an example of a six-measure phrase that ends with a V^7-i cadence in G minor.

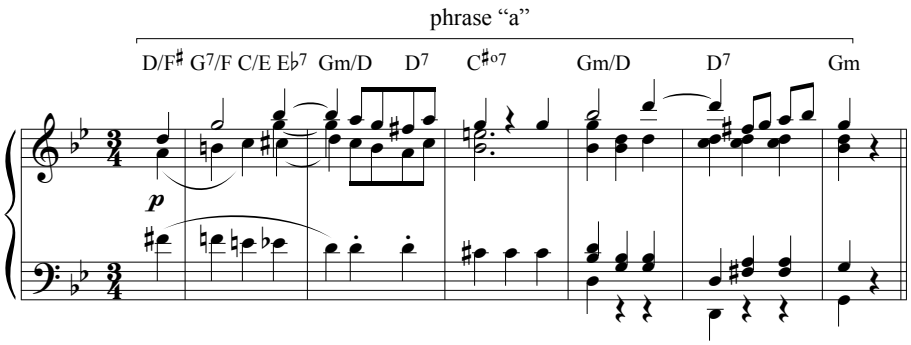


Figure 11.4.4 W.A. Mozart, Symphony No. 40, K. 550, III (1788)

Here is an example of an 8-measure phrase.

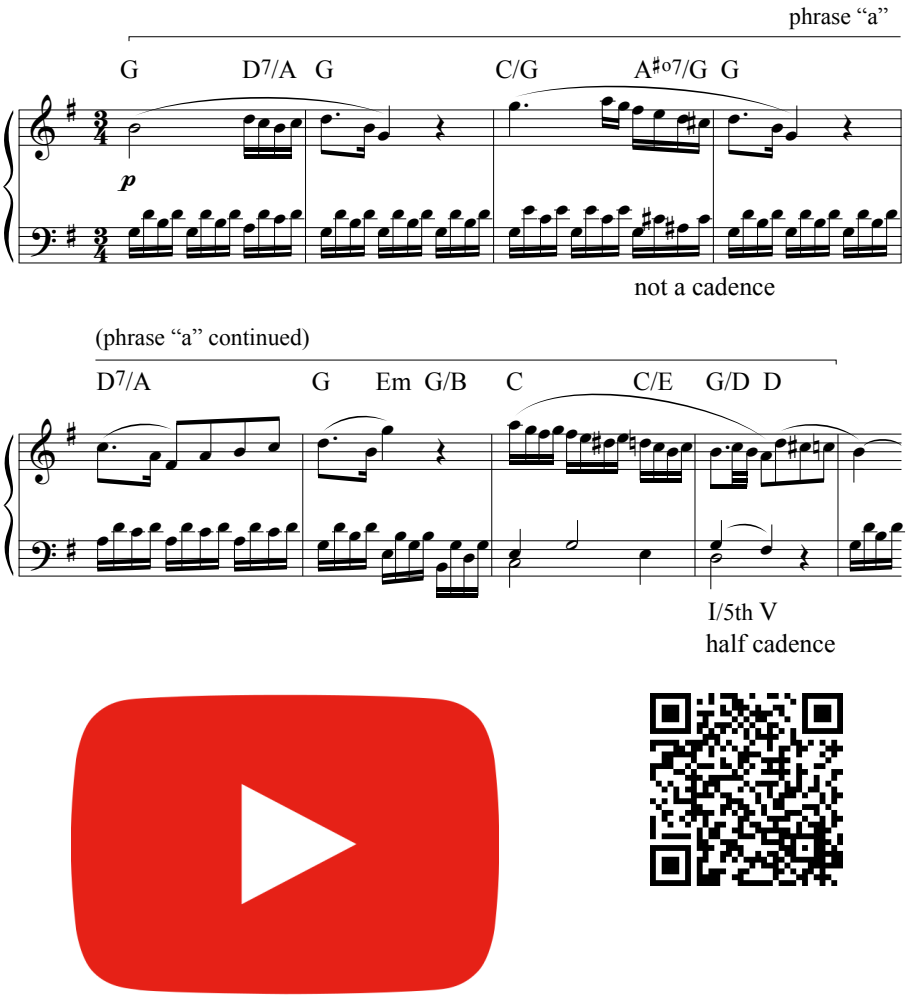


Figure 11.4.5 W.A. Mozart, Piano Sonata in C Major, K. 545, II

Examples of seven-measure phrases are rare and often involve elisions, which will be covered in a later chapter when we discuss how phrases are combined to create small forms like periods and phrase groups.

11.5 Subphrase

Subphrases are smaller than phrases but larger than motives. Most of the subphrases we encounter will be two measures long. Subphrases are called "phrase segments" and "phrase members" in other texts.

We will label subphrases with letters (*a, b,* etc.). When a subphrase repeats but has slight alterations, we will put an apostrophe after the letter (e.g., *a'*) and refer to it as "a prime." If another alteration to subphrase a occurs, we will label it as *a"* and refer to it as "a double prime." If the subphrase is merely transposed (in a sequence), we will label it as *a,* not *a'* in our analysis.

We are including analysis of subphrases in this text because many compositions have melodic units that are two measures long. Analyzing subphrases helps us understand the construction of melodies.

In the following example, notice that subphrases *a* and *a'* have the same first six notes (G♯–F♯–B–C♯–E–E).

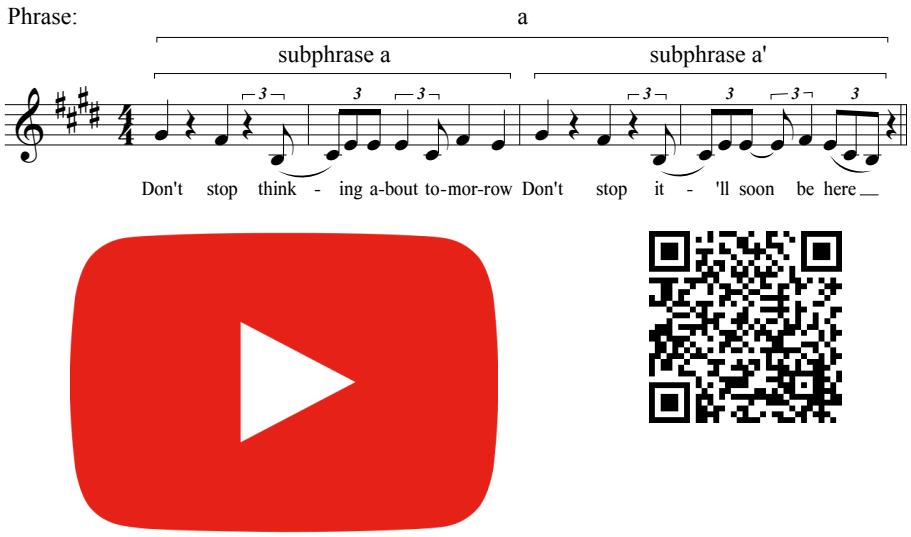


Figure 11.5.1 Christine McVie, "Don't Stop" (1977)

Here is an example of a four-measure phrase with subphrases *a* and *b*.

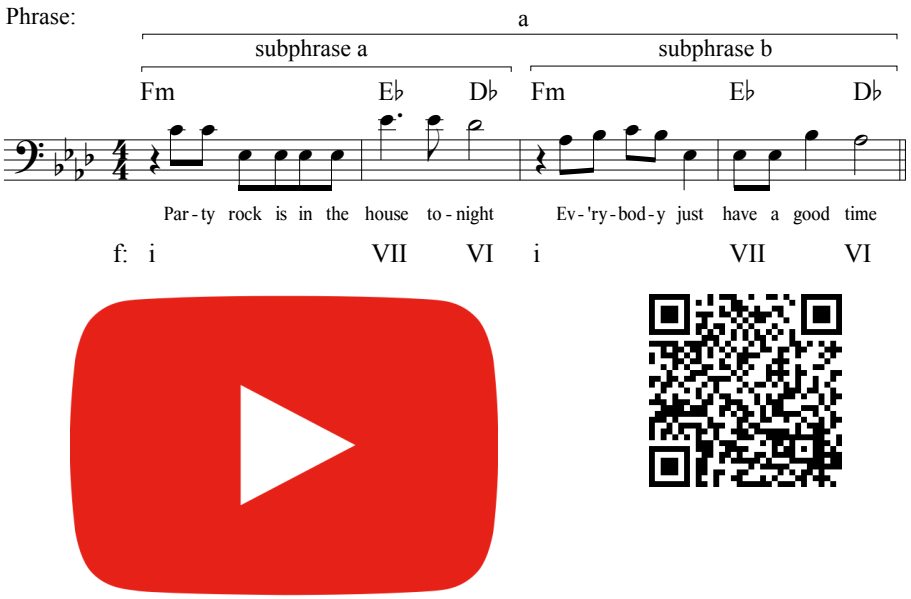


Figure 11.5.2 Stefan Gordy and Skyler Gordy, "Party Rock Anthem" (2011)

Notice that we are not looking at the motives within these subphrases. This is because we are looking for melodic segments that are repeated. For some compositions it is more informative to look at subphrases and less informative to identify motives if motives are not extracted and developed.

There will be times when you will notice important melodic ideas happening at three levels of analysis (motive, subphrase, and phrase), as in the following example.

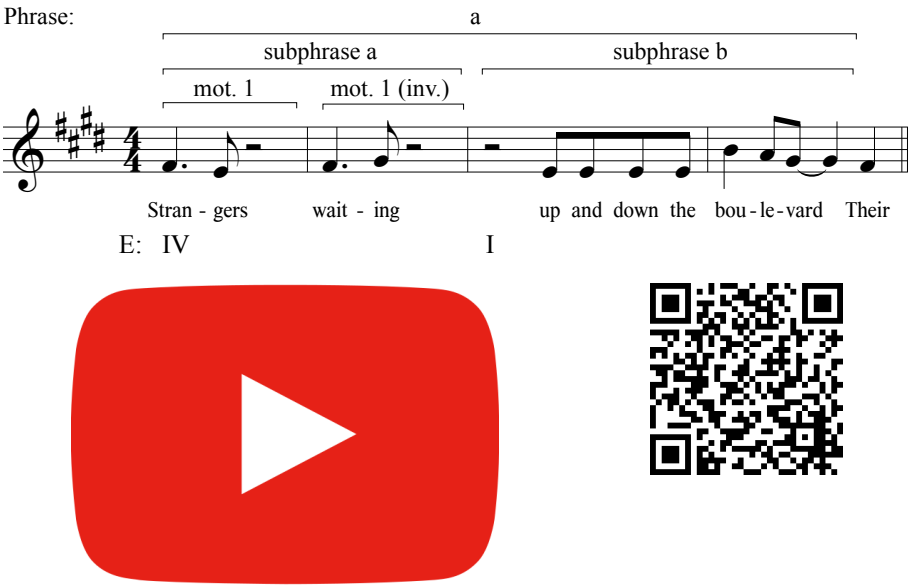


Figure 11.5.3 Steve Perry, Jonathan Cain, Neil Schon, "Don't Stop Believin"' (1981)

There is ambiguity between motive and subphrase. Reconsider the following example from the section on intervallic change:

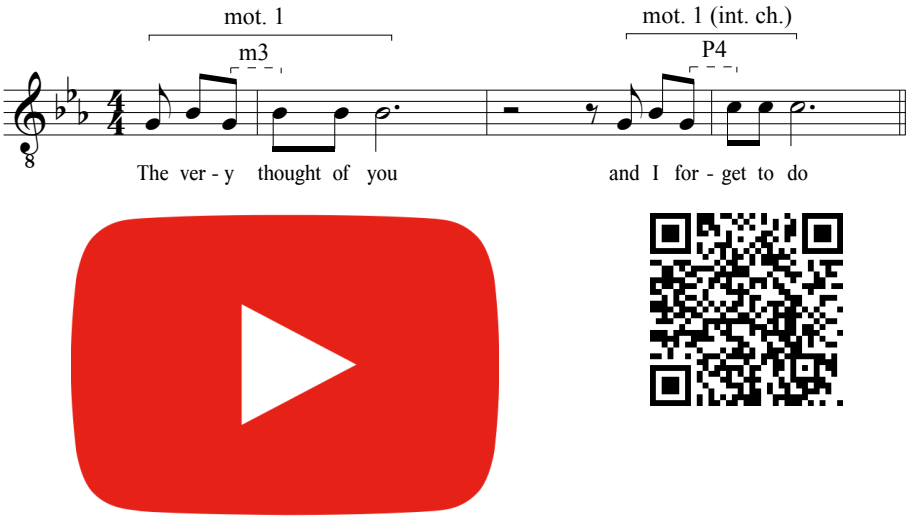


Figure 11.5.4 Ray Noble, "The Very Thought of You" (1934)

When you listen to the music of "The Very Thought of You" you will hear that each motive lasts for two measures. The difference is that motives are typically short—two to seven notes—whereas subphrases will usually contain six or more notes and occupy two measures (half of a four-measure phrase).

11.6 Practice Exercises

Exercise Group. Day One:

1. For the following examples:
    - Analyze motives using numbers (1, 2, etc.)

- Label lead-sheet symbols and Roman numerals when blanks are provided
- Label non-chord tones for notes in parentheses

(Note: Even though there are 11 blanks for motives, there are only six motives in this example due to motivic alteration.)

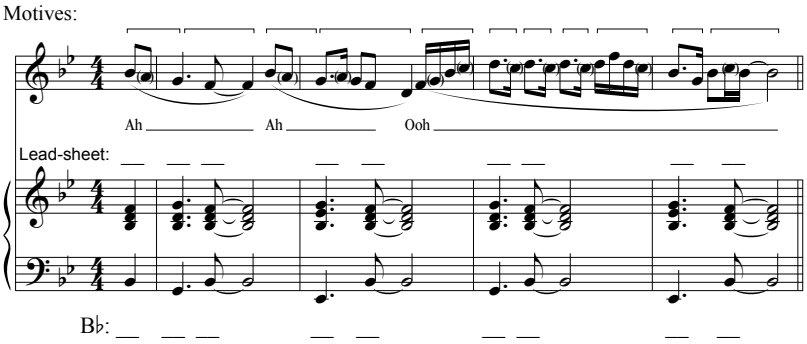
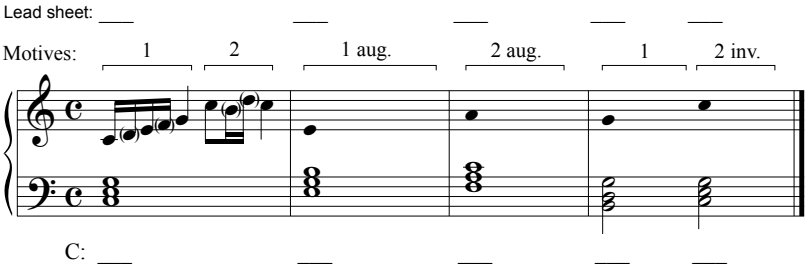


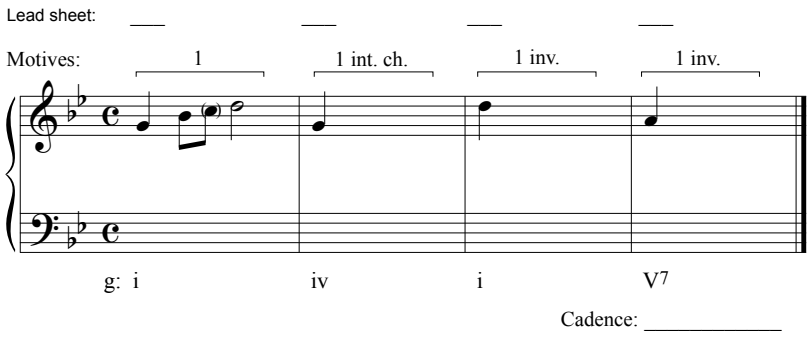
Figure 11.6.1 Charlie Puth, Cameron Thomaz, Andrew Cedar, Justin Franks, "See You Again" (2015)

2. For the following example, alter the given motives as specified. Also, provide lead-sheet symbols and Roman numerals and analyze non-chord tones.



3. For the following example:

- Write the lead-sheet symbols
- Write the chords as whole notes in the bass clef staff
- Analyze non-chord tones, including the ones you write
- Alter the given motives as specified to fit the harmony
- Specify the cadence



Exercise Group. Day Two:

4. For the following example:

- Analyze the motives using numbers (1, 2, etc.), noting motivic alterations when applicable
- Analyze subphrases using letters and primes (*a*, *a'*, *b*, etc.)
- Label lead-sheet symbols and Roman numerals when blanks are provided
- Label non-chord tones for notes in parentheses

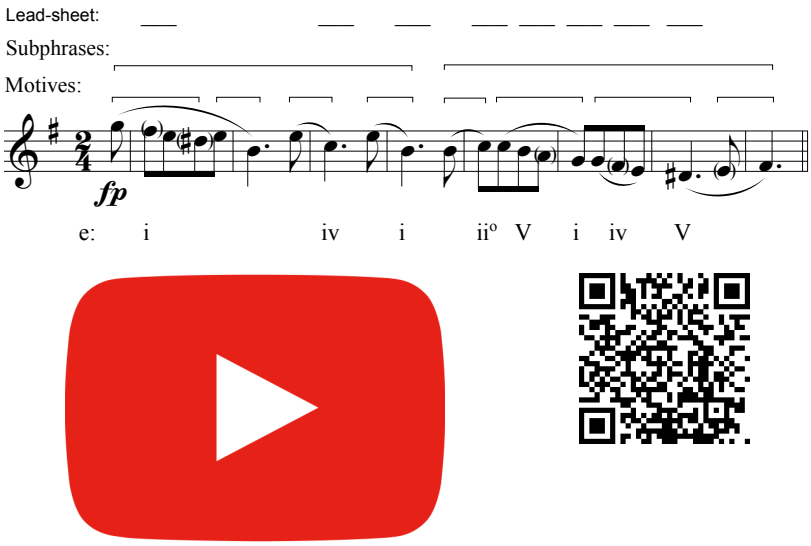


Figure 11.6.2 Robert Schumann, *Album for the Young*, Op. 68, No. 16, "First Loss"

Click here to download the first assignment for this chapter.
Click here to download the second assignment for this chapter.
Click here to download the Unit 2 Practice Test.

Chapter 12

Form in Popular Music

The overall form of a piece of popular music usually can be broken down into smaller 4-, 8-, 12-, or 16-bar sections. The material in this chapter is informed by John Covach's essay "Form in Rock Music" from *Engaging Music: Essays in Music Analysis* (ed. D. Stein).

12.1 Verse-Chorus Form

The **Verse-Chorus form** is arguably the most common musical form of present day popular music and is probably familiar to most readers of this text. In Verse-Chorus form, the chorus contains the "hook"—the memorable refrain—while the verse typically contains less memorable melodic material. A clear example can be found in the 1985 song "We Are the World."

Table 12.1.1 Michael Jackson and Lionel Richie, "We Are The World" (1985)

0:00–0:26	*Introduction*, 6 bars
0:26–0:53	*Verse 1*, 8 bars
0:53–1:18	*Verse 2*, 8 bars
1:18–1:49	*Chorus*, 9 bars
1:49–2:14	*Verse 3*, 8 bars
2:14–2:41	*Chorus*, 8 bars
2:41–3:08	*Bridge*, 8 bars
3:08–3:35	*Chorus*, 8 bars
3:35–4:02	*Chorus*, 8 bars ending with key change
4:02–end	*Chorus*, 7 times in F major with fade out

Common additions to the Verse-Chorus form, beside the bridge, are the pre-chorus and post-chorus.

Table 12.1.2 Kurt Cobain, Krist Novoselic, and Dave Grohl, "Smells Like Teen Spirit" (1991)

0:00–0:25	*Introduction*, 12 bars
0:25–0:42	*Verse 1*, 8 bars
0:42–0:58	*Pre-chorus*, 8 bars
0:58–1:23	*Chorus*, 12 bars
1:23–1:31	*Post-chorus*, 4 bars
1:31–1:39	*Interlude*, 4 bars
1:39–1:56	*Verse 2*, 8 bars
1:56–2:12	*Pre-chorus*, 8 bars
2:12–2:37	*Chorus*, 12 bars
2:37–2:45	*Post-chorus*, 4 bars
2:45–3:02	*Guitar solo*, 8 bars
3:02–3:10	*Interlude*, 4 bars
3:10–3:26	*Verse 3*, 8 bars
3:26–3:42	*Pre-chorus*, 8 bars
3:42–4:37	*Chorus*, 21 bars

It is worth noting that there may disagreement about labeling sections in a form. One person may call a section a "pre-chorus," another may call it a "first chorus," while another may call it "verse part b." There is ambiguity in naming sections and disagreement is to be expected.

There are "simple" and "contrasting" verse-chorus forms. A **simple verse-chorus** form has the same harmonic progression for the verse and chorus (e.g., "All About That Bass"). The chord progressions for the verse and chorus are different in a **contrasting verse-chorus** form like "We Are the World."

12.2 AABA Form

The AABA form is associated with the hits from Broadway musicals in the 1930s and remained one of the most popular forms of popular music until the 1950s, when Rock 'n' Roll became popular. Each section (A or B) is typically 8 measures long. The A sections contain the primary melody we associate with the song while the B section provides contrast and is often called the "bridge" or "middle eight."

Table 12.2.1 George Gershwin, "I Got Rhythm" (1930)

0:00–0:10	*Introduction*, 8 bars
0:10–0:18	*A section (A1)*, 8 bars
0:18–0:26	*A section (A2)*, 8 bars
0:26–0:35	*B section*, 8 bars
0:35–0:45	*A section (A3)*, 10 bars
0:45–0:53	*A section*, 8 bars (instrumental shout chorus)
0:53–1:02	*Introduction*, 8 bars (shout chorus continues)
1:02–1:10	*A section (A1)*, 8 bars
1:10–1:19	*A section (A2)*, 8 bars
1:19–1:27	*B section*, 8 bars
1:27–1:35	*A section (A3)*, 8 bars
1:35–1:54	*Coda*, 12 bars

It is common for one or more of the A sections to be instrumental, and it is also common to eliminate an A section on the repeat of the entire AABA form (AABAABA, for example).

Other well known songs with AABA form include "Over the Rainbow" from *The Wizard of Oz* as well as many famous songs from the *Great American Songbook* by George Gershwin ("Let's Call the Whole Thing Off," "Someone to Watch Over Me"), Cole Porter ("Anything Goes," "Love for Sale," "I Get A Kick Out of You"), Irving Berlin ("Blue Skies," "Puttin' on the Ritz"), and Jerome Kern ("The Way You Look Tonight," "Smoke Gets In Your Eyes").

The AABA form continued to be dominant into the 1960s (including Beatles songs like "Yesterday," "Norwegian Wood," and "Hey Jude," to name a few). The AABA form is less common in the present day but can be found in songs like The Cure's "Friday, I'm in Love" (1992) and Norah Jones's "Don't Know Why" (1999).

A note on terminology: the entire 32-bar AABA form is sometimes called a "refrain" or "chorus," and some AABA songs are preceded by a "verse."

This means a song like "Someone To Watch Over Me" begins with a verse and is followed by a "refrain" (which could also be called a "chorus"). Other synonymous terms you may encounter for "verse" in the context of AABA form are "prelude" and "introduction."

12.3 ABAC Form

Many popular songs from the 1930s–1950s were in the 32-bar ABAC form. Well-known examples include "White Christmas," "Someday My Prince Will Come," and "When I Fall In Love."

"Star Dust" is an example of an ABAC form that is usually performed with a verse preceding the refrain.

Table 12.3.1 Hoagy Carmichael, "Star Dust" (1927)

0:00–0:13	*Introduction*, 4 bars
0:13–1:13	*Verse*, 16 bars (8 bars + 8 bars)
1:13–1:41	*A section*, 8 bars
1:41–2:07	*B section*, 8 bars
2:07–2:32	*A section*, 8 bars
2:32–2:57	*C section*, 6 bars
2:57–3:12	*Coda*, 4 bars

The ABAC form may also occur as ABAB' where the B' section begins the same as the B section but ends differently.

12.4 The 12-Bar Blues

Associated with the Blues genre, which originated in the early 1900s, the 12-bar **blues progression** was also popular during the Swing Era of the 1930s and 1940s, (examples include "In The Mood" and "One O'Clock Jump"), as well as during the early years of Rock 'n' Roll in the 1950s ("Johnny B. Goode," "Hound Dog," "Rock around the Clock"). The basic 12-bar blues progression is shown below.

Table 12.4.1 Chuck Berry, "Johnny B. Goode" (1958)

Bars 1–4:	I	I	I	I
Bars 5–8:	IV	IV	I	I
Bars 9–12:	V	IV	I	I

12.5 Harmonically Closed and Open Sections

A harmonically closed section ends on the tonic chord (I). A harmonically open section typically ends on a non–tonic chord like V, but could also end on IV.

In an AABA form, the A sections are usually harmonically closed, ending on I, and the B section (or bridge) is usually harmonically open, ending on V.

In verse-chorus form, sections that leads into the chorus (verse, pre-chorus, and bridge) are usually harmonically open, while choruses can be harmonically closed or open.

If you compose a piece in AABA or verse-chorus form, placing harmonically open and closed sections appropriately is important to the flow of the music.

For example, the verse and bridge on "We Are the World" are harmonically open (ending on V) while the chorus is harmonically closed (ending on the tonic chord, I).

12.6 Practice Exercises

1. For each song, fill in the beginning time for each section, label each section type (verse, pre-chorus, chorus, post-chorus, interlude, introduction, A, B, or C section, etc.), and the number of bars in each section of the form.

Table 12.6.1 Tom Bahler, "She's Out of My Life" (1980)

(a)

Time:	__ : __ __	Section Type: _____,	_____	bars
Time:	__ : __ __	Section Type: _____,	_____	bars
Time:	__ : __ __	Section Type: _____,	_____	bars
Time:	__ : __ __	Section Type: _____,	_____	bars
Time:	__ : __ __	Section Type: _____,	_____	bars

Table 12.6.2 Lennon-McCartney, "Penny Lane"

	Time: __ : __ __	Section Type: _____,	_____	bars
	Time: __ : __ __	Section Type: _____,	_____	bars
	Time: __ : __ __	Section Type: _____,	_____	bars
	Time: __ : __ __	Section Type: _____,	_____	bars
	Time: __ : __ __	Section Type: _____,	_____	bars
	Time: __ : __ __	Section Type: _____,	_____	bars
	Time: __ : __ __	Section Type: _____,	_____	bars
	Time: __ : __ __	Section Type: _____,	_____	bars
	Time: __ : __ __	Section Type: _____,	_____	bars
(b)	Time: __ : __ __	Section Type: _____,	_____	bars

Click here to download the homework assignment for this chapter.

Chapter 13

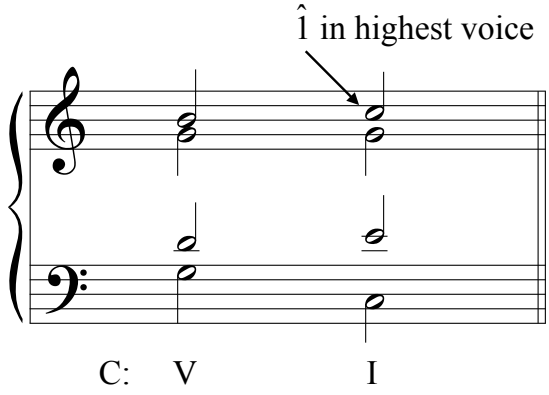
Phrases in Combination

13.1 The Perfect Authentic Cadence

We will now distinguish between two types of authentic (V–I) cadences: the Perfect Authentic Cadence (PAC) and the Imperfect Authentic Cadence (IAC).

The **Perfect Authentic Cadence** must meet three requirements:

1. V–I
2. Both chords in root position
3. Tonic scale degree ($\hat{1}$) in the highest voice of the tonic chord



If at least one of these requirements is not met (one or both of the chords are inverted, tonic is not in the highest voice, or vii° occurs in place of V), the cadence is an **Imperfect Authentic Cadence** (IAC).

13.2 The Sentence

A **sentence** in music *is a phrase* with a specific melodic construction: a melodic idea (motive 1 or subphrase a) is either repeated or sequenced then followed by either related or unrelated material leading to a cadence.

In this first example, Mozart sequences motive 1 from measure 1 down a step in measure 2. Measure 3 contains related material and measure 4 contains cadential material.

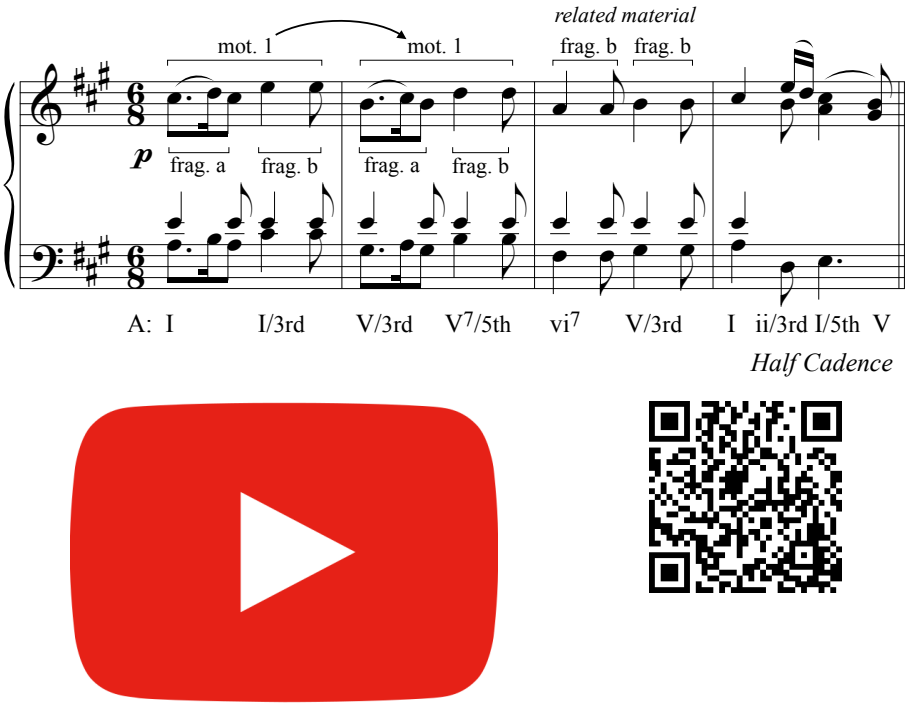


Figure 13.2.1 Sentence Structure in Mozart, K. 331, I

In the next example, Beethoven changes the intervals of subphrase a in measures 3–4 to fit the dominant harmony. He extracts motive 2 from subphrases a and a' in measures 5–6. Measures 7–8 lead to a half cadence.

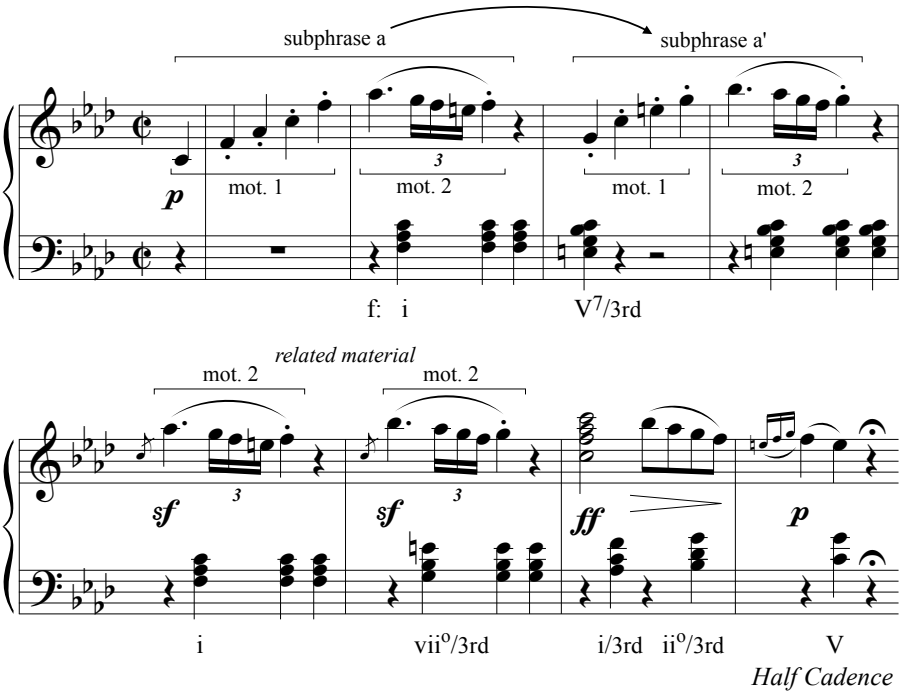


Figure 13.2.2 Sentence Structure in Beethoven, Op. 2, No. 1, I

In the next example, unrelated material follows subphrase a and its repetition.

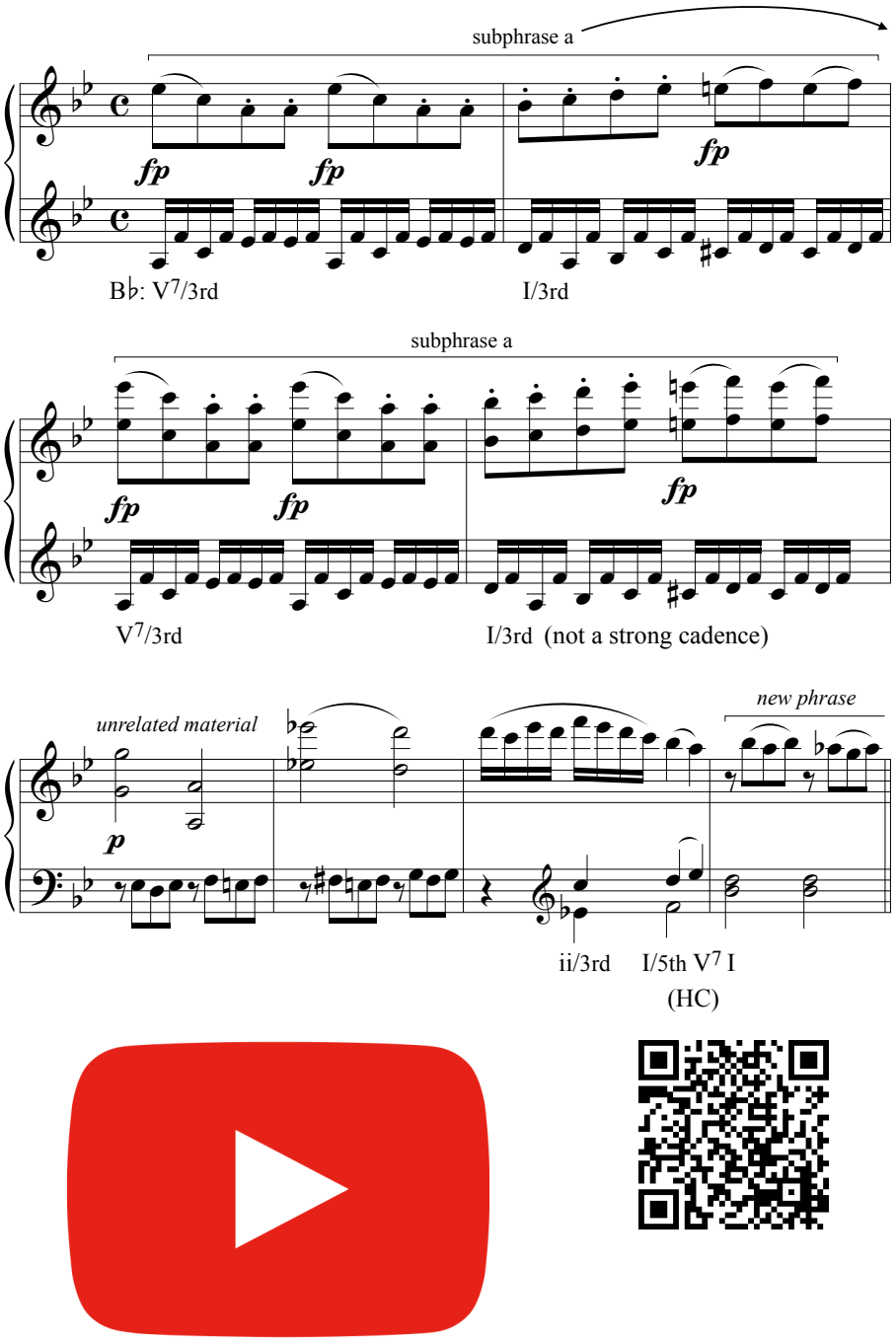


Figure 13.2.3 Sentence Structure in Mozart, K. 333, I (1783)

13.3 The Period

In music, a **period** consists of at least two phrases with the final phrase ending in a more conclusive cadence than the first phrase.

13.3.1 Conclusiveness of Cadence

Because period form involves "more conclusive" and "less conclusive" cadences, it is important to distinguish between inconclusive and conclusive cadences. Conclusive cadences end on the tonic chord, while inconclusive cadences do not.

Inconclusive Cadences	*Conclusive Cadences*
Deceptive Cadence (V–vi)	Authentic Cadence (V–I)
Half Cadence (ends on V)	Plagal Cadence (IV–I)

In addition, the perfect authentic cadence (PAC) is more conclusive than the imperfect authentic cadence (IAC). While the plagal cadence (PC) occurs less frequently than the other three cadences listed in the table above, it will sometimes occur in root position at the end of a phrase after an inverted imperfect authentic cadence (IAC) has concluded a previous phrase, with the understanding that a root position PC could be considered more conclusive than an inverted IAC.

Generally, a period will either contain a phrase ending in a half cadence (HC) followed by a phrase ending in an authentic cadence (IAC or PAC), or it will contain a phrase ending in an IAC following by a phrase ending in a PAC.

13.3.2 Examples of the "Less Conclusive-More Conclusive" Cadential Formula

In the first example, a HC concludes the first phrase and a PAC concludes the second phrase, making a period.

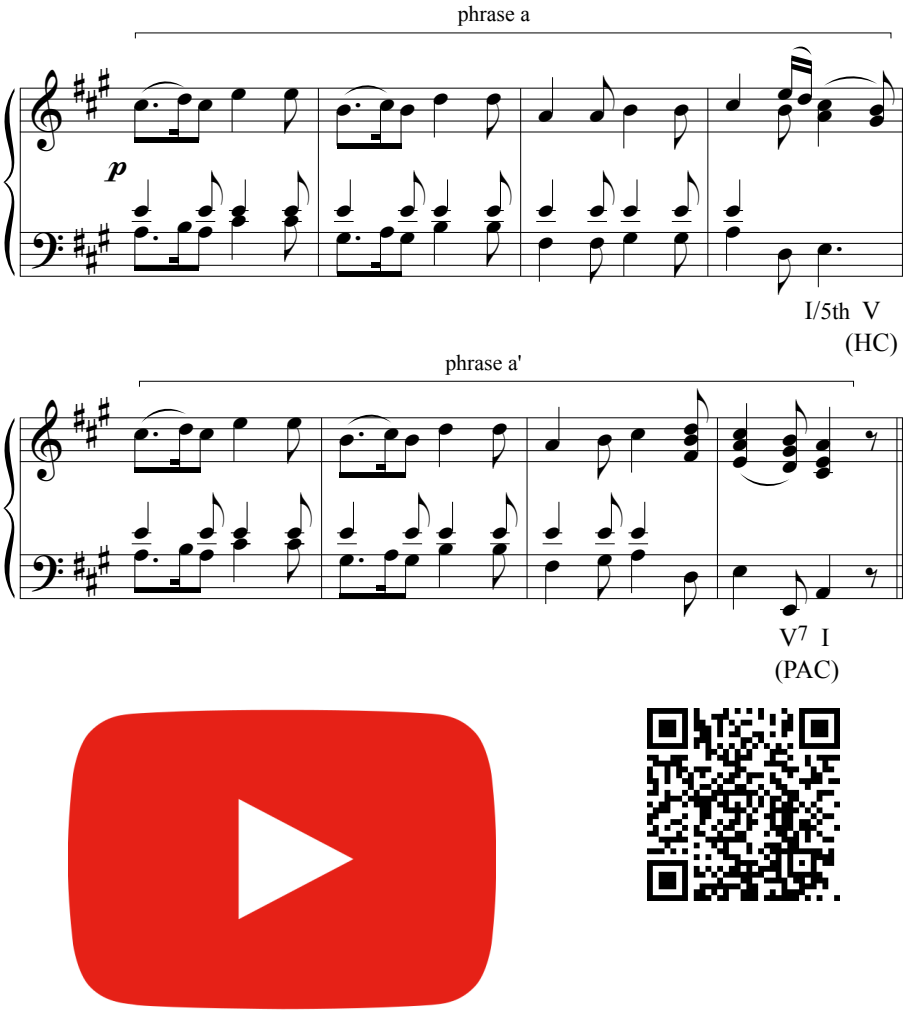


Figure 13.3.1 Mozart, Piano Sonata K. 331, I

Here is a formal diagram of the above example.

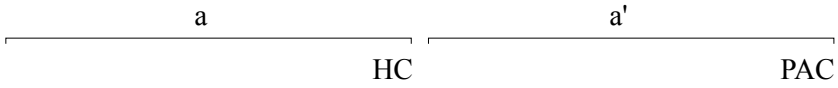


Figure 13.3.2 Diagram of Mozart, K. 331, I, mm. 1-8

Notice that one or more phrases within a period can be a sentence, as in the example above, since sentences are phrases with specific melodic structure.

In the next example, the first phrase concludes with an IAC and the second phrase concludes with a PAC.

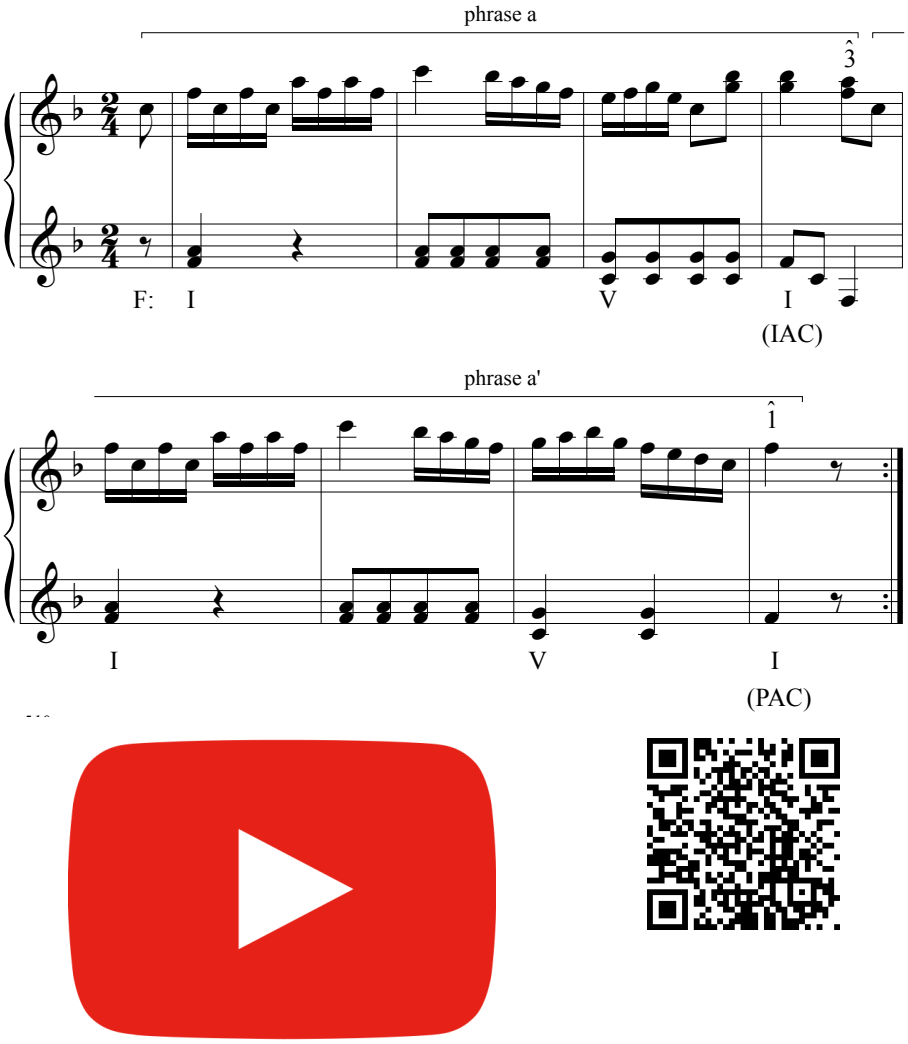


Figure 13.3.3 Joseph Haydn, Piano Sonata in F Major, Hob. XVI:9, III. Scherzo

In the next example, the first phrase ends with an IAC and is followed by a second phrase ending with a PAC.

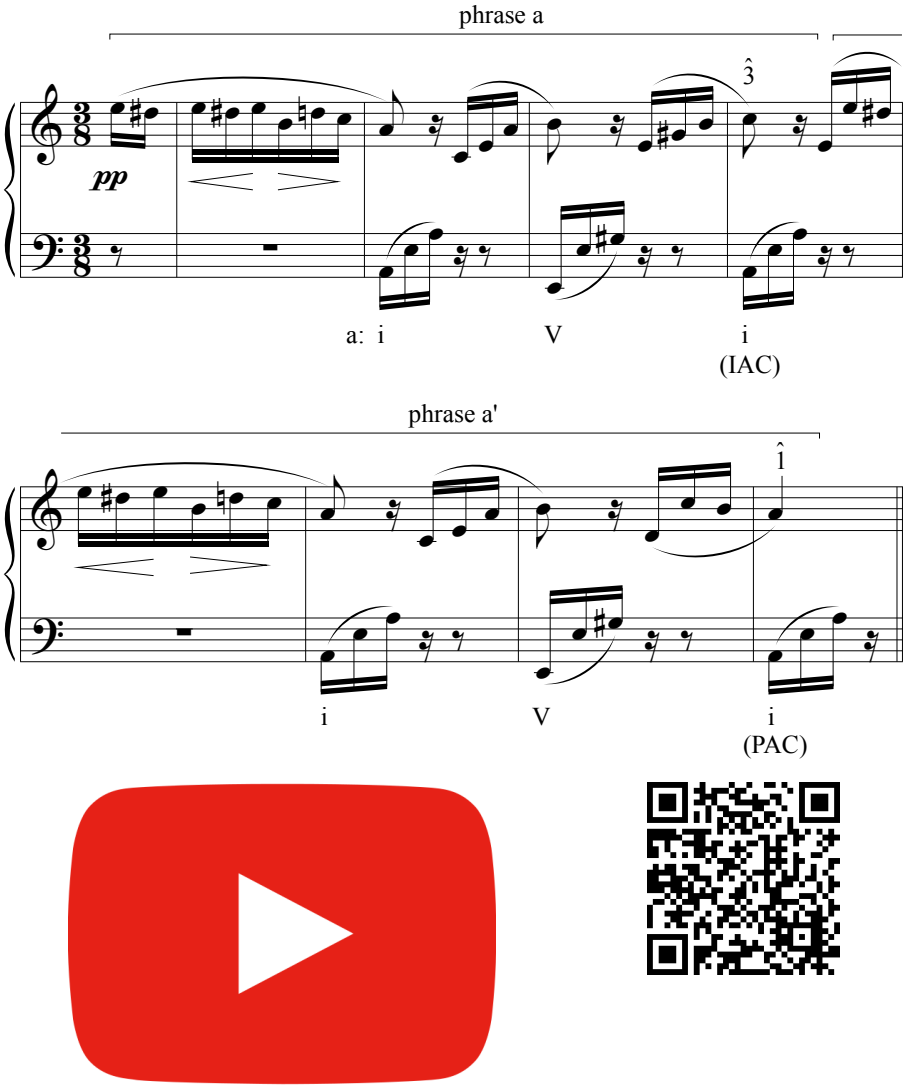


Figure 13.3.4 Beethoven, Bagatelle in A minor, WoO 59, "Für Elise"

Another example with a less conclusive cadence followed by a more conclusive cadence is "Lean on Me" by Bill Withers.

Figure 13.3.5 "Lean on Me" (1972) by Bill Withers

13.3.3 Antecedents and Consequents

In a period, the phrase ending with the less conclusive cadence is called the "**antecedent**" and the phrase ending with the more conclusive cadence is called

the "**consequent**." These can be thought of as being in a "question and answer" relationship.

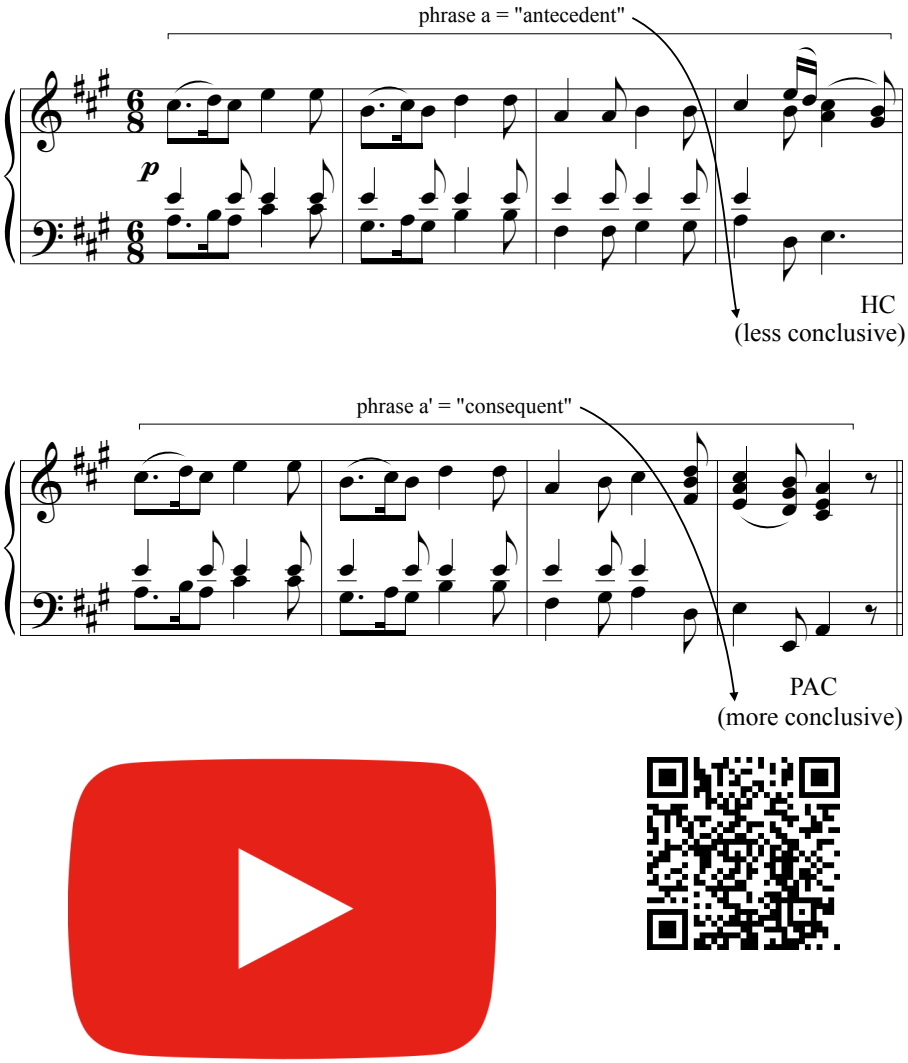


Figure 13.3.6 Antecedent and Consequent in Mozart, Piano Sonata K. 331, I

13.3.4 Parallel and Contrasting Periods

Periods are labeled as "parallel" or "contrasting" based on the melodic material. In a **parallel period**, the melodies in both phrases begin similarly. In a **contrasting period**, the phrases begin differently.

The three preceding examples are parallel periods.

The apostrophe mark (') is called "prime" and is used to show a phrase is similar to a previous phrase but ends with a different cadence. Therefore a' is called "a prime" and a" is called "a double prime." If you are analyzing a piece that requires triple and quadruple primes, it is clearer to use a^1, a^2, a^3, and so on.

Below is an example of a contrasting period.

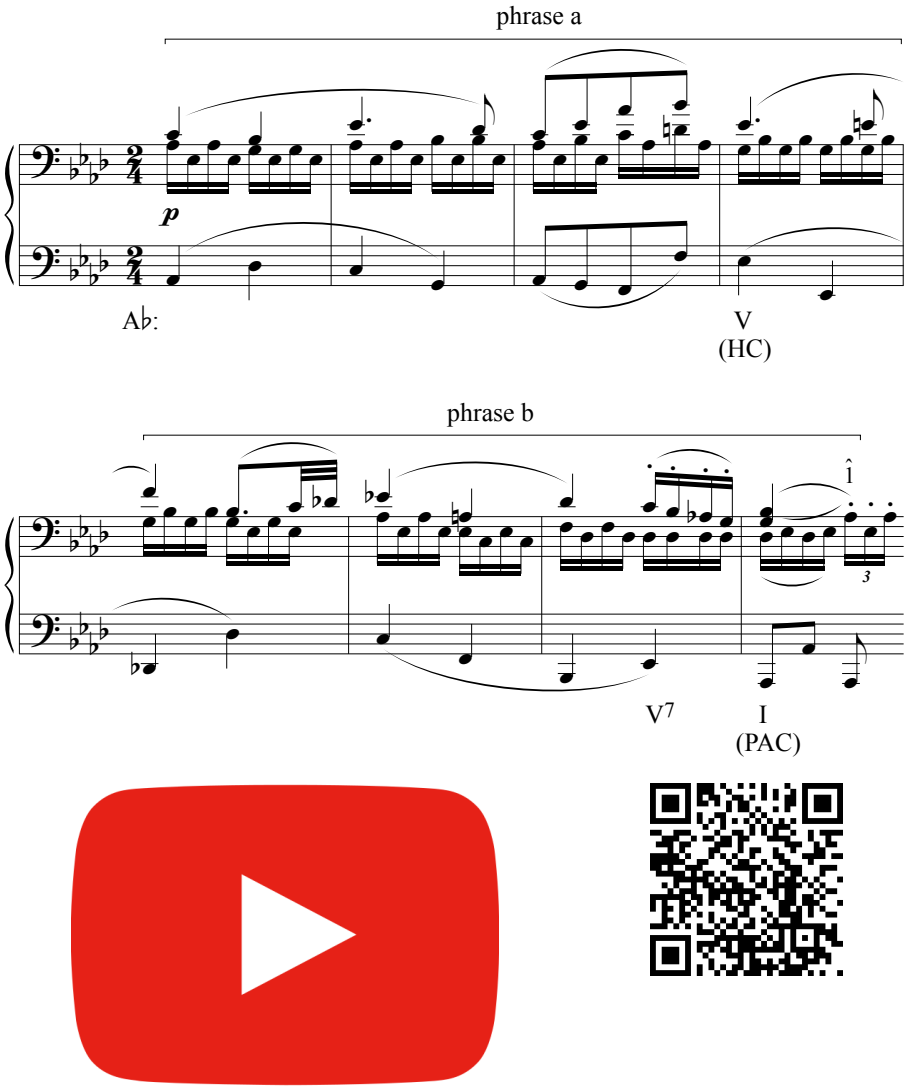


Figure 13.3.7 Beethoven, Piano Sonata in C minor, Op. 13, (Pathétique), II

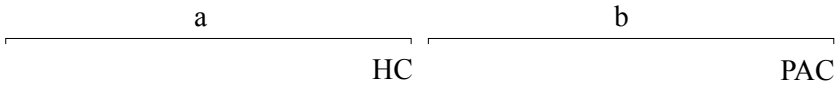


Figure 13.3.8 Formal diagram of the example above (2nd movement of Beethoven Pathétique sonata)

13.3.5 Repeated Phrase

If you encounter a section consisting of the same phrase occurring twice, call it a "repeated phrase."

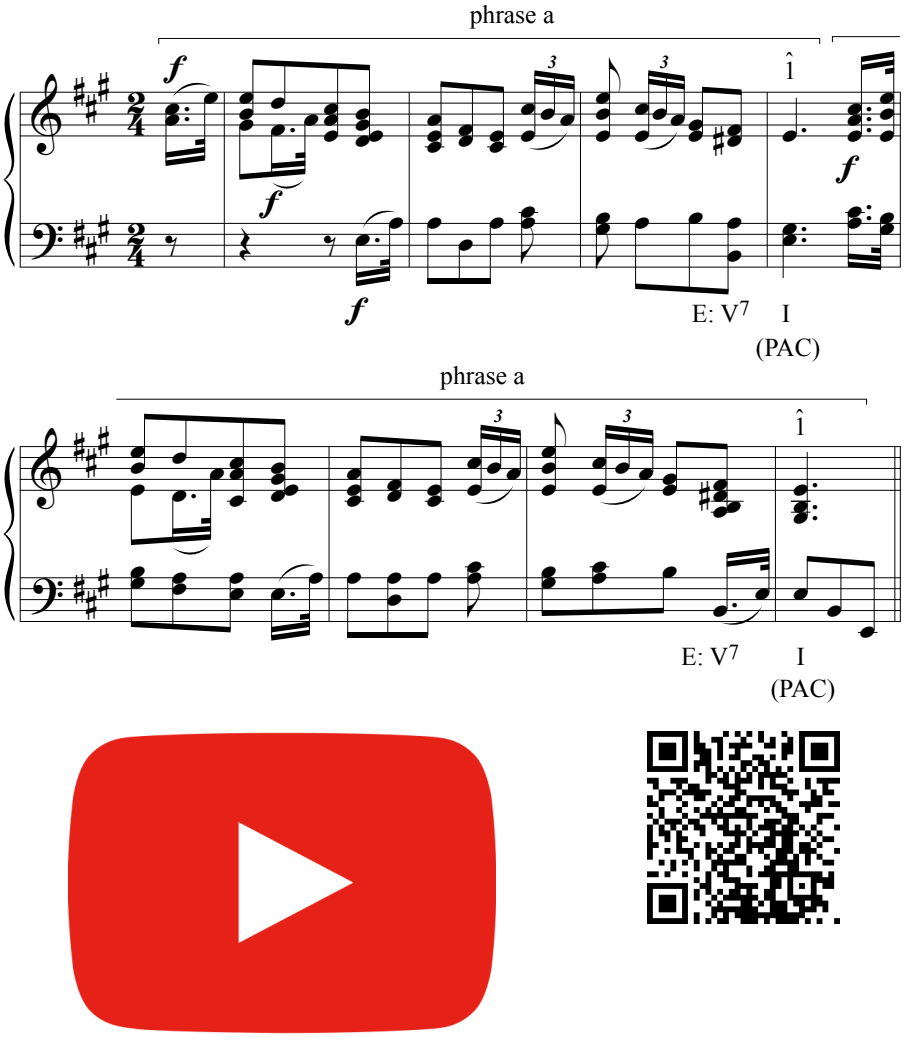


Figure 13.3.9 Robert Schumann, Album for the Young, Op. 68, No. 17, "Little Morning Wanderer"

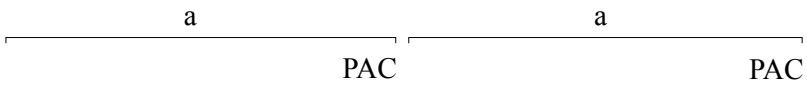


Figure 13.3.10 Formal diagram of the example above ("Little Morning Wanderer")

In following two sections, we will examine periods containing more than two phrases.

13.4 The Asymmetrical Period

Asymmetrical periods consist of three or five phrases. In an asymmetrical period, there will be an unequal number of antecedents and consequents, hence the "asymmetry." In the example below, there is one antecedent and two consequents.

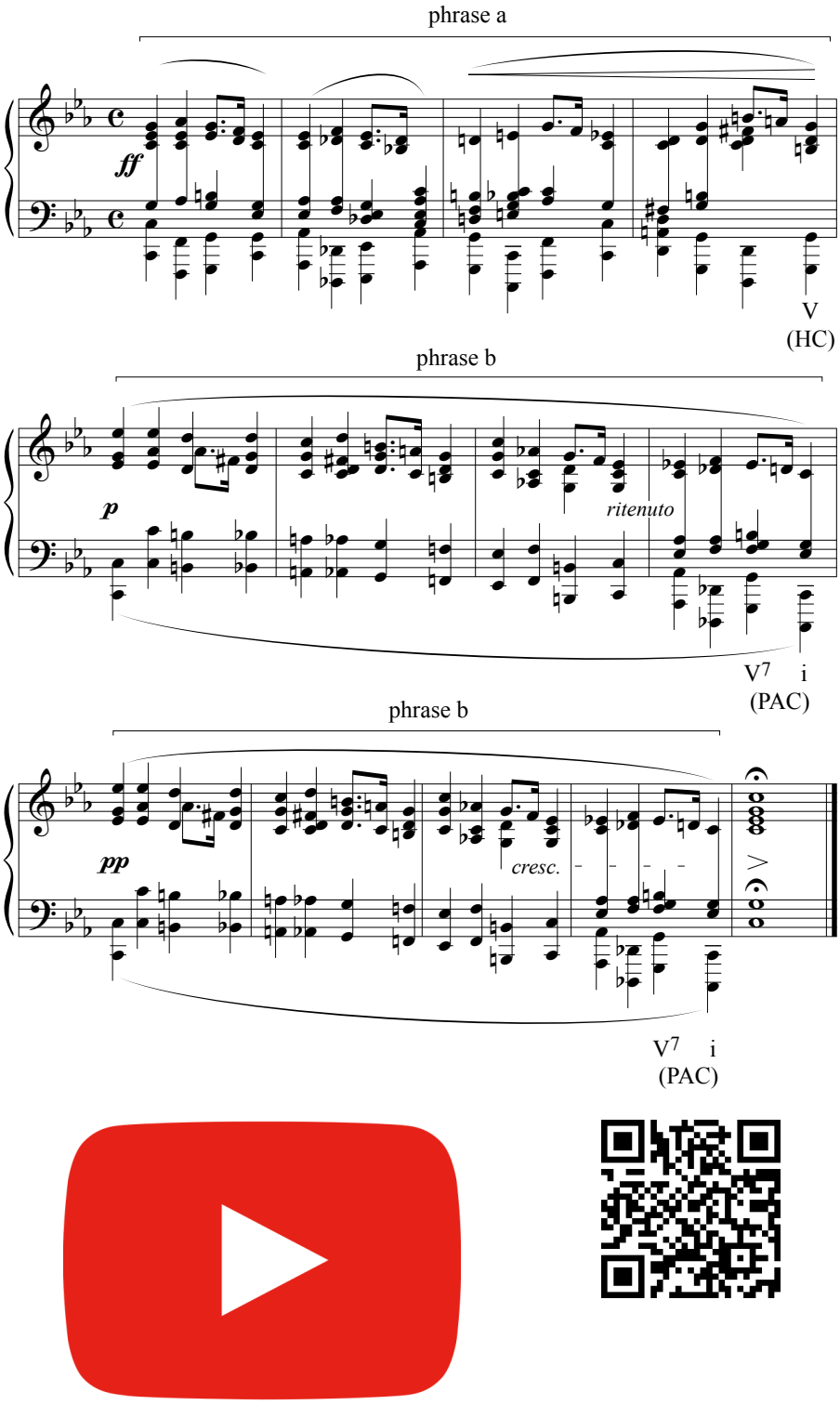


Figure 13.4.1 Frédéric Chopin, Prelude Op. 28, No. 20, in C minor

13.5 The Double Period

The Double Period. A **double period** consists of at least 4 phrases and is comprised of an **antecedent group** and a **consequent group**. The first two

phrases in a double period are the antecedent group and the final two phrases are the consequent group, which ends with a cadence that "answers" the less conclusive cadence (or "question") that ended the antecedent group.

The melodic scheme of *abab'* (four phrases) is commonly encountered in a double period. A double period with this melodic scheme would be described as a "*parallel* double period" because both the antecedent group and consequent group begin with the same melody.

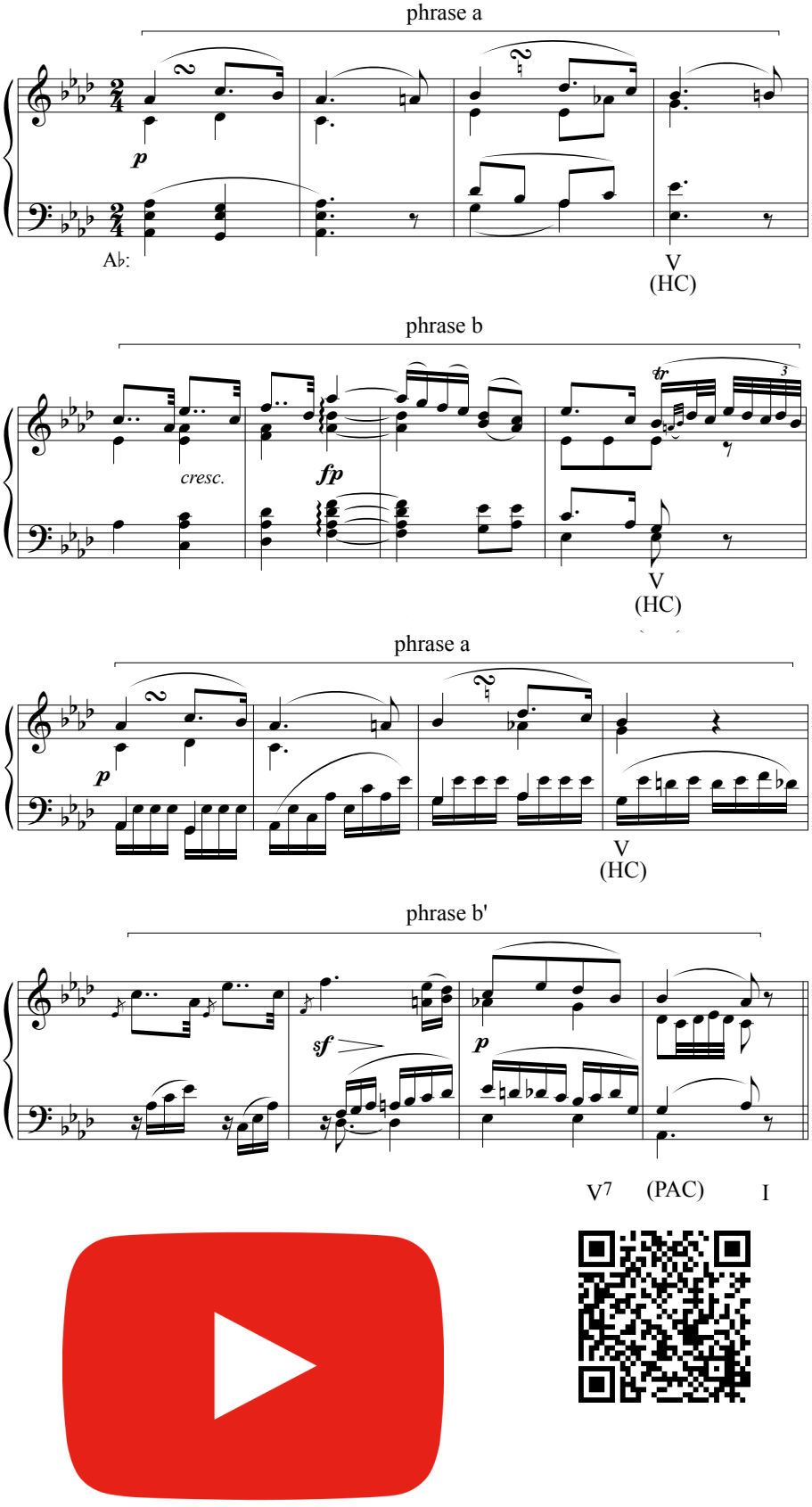


Figure 13.5.1 Beethoven, Piano Sonata Op. 10, No. 1, II

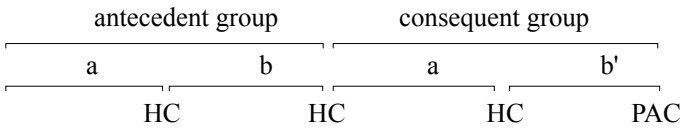


Figure 13.5.2 Formal diagram of a double period (Beethoven, Op. 10, No. 1, II)

A double period will typically have one of the following cadential schemes:

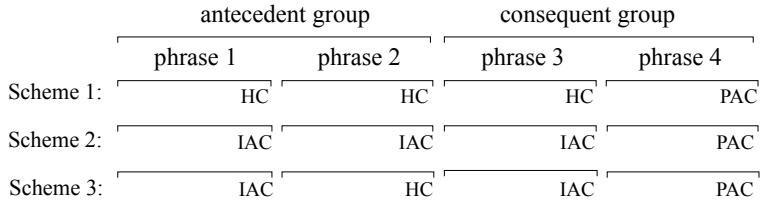


Figure 13.5.3 Possible cadential schemes in a double period

Notice that the first two phrases of an antecedent group can consist of an IAC followed by a HC ("Scheme 3" in the above example). This may seem confusing if you are focused on analyzing phrases solely in groups of two instead considering how many phrases are in a section before analyzing the cadential scheme and the form.

13.5.1 Repeated Period

You may encounter a section consisting of four phrases that is not a double period but instead is a **repeated period**.

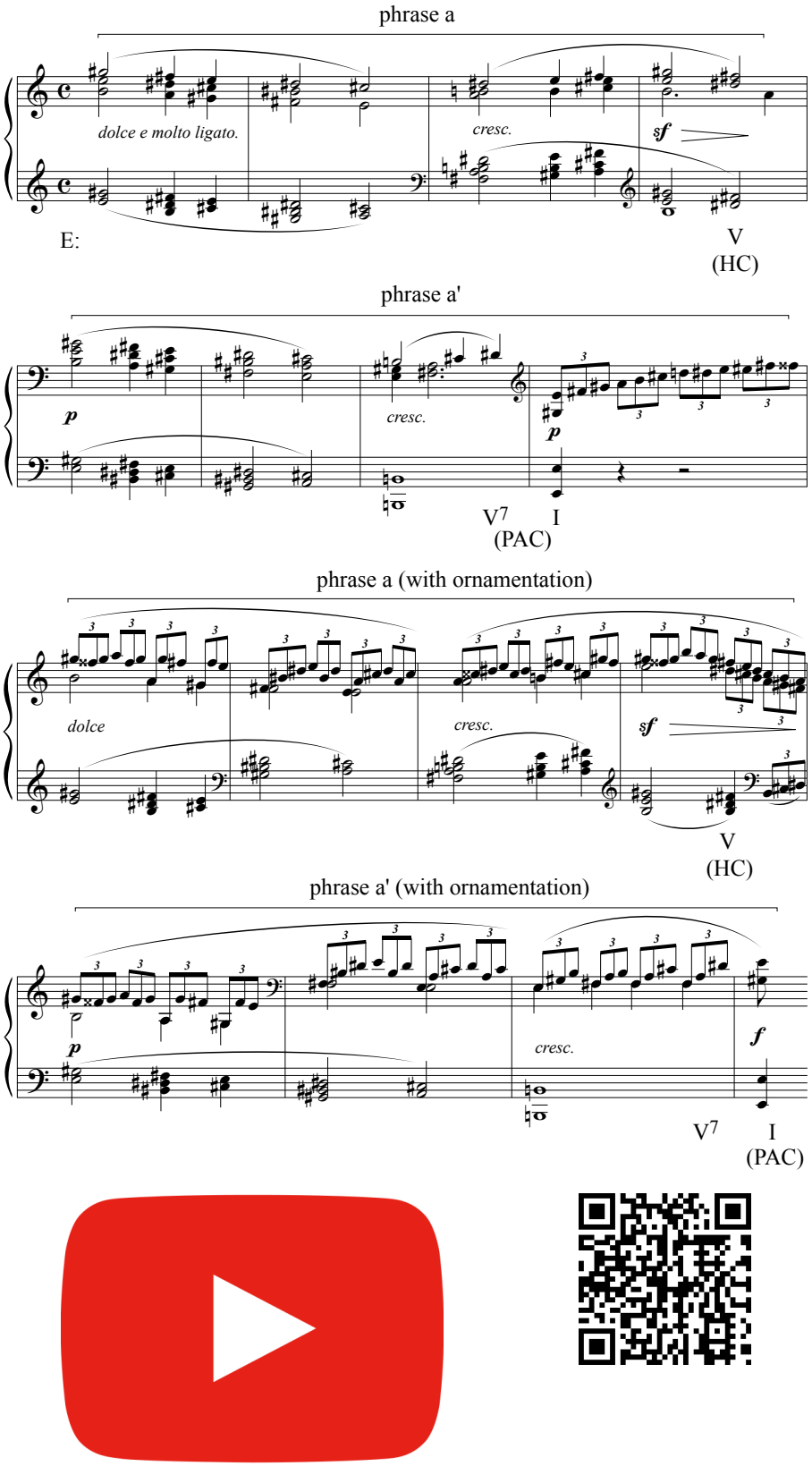


Figure 13.5.4 Beethoven, Piano Sonata Op. 53, I

Examine the difference between these two formal diagrams, noting the

cadence after the *second* phrase in each:

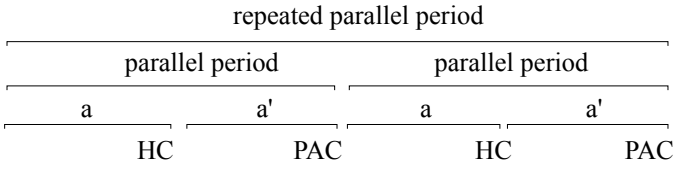


Figure 13.5.5 Formal diagram of a repeated period (Beethoven, Op. 53, I)

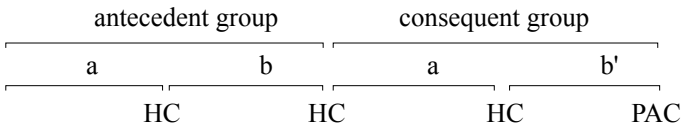


Figure 13.5.6 Formal diagram of a double period (Beethoven, Op. 10, No. 1, II)

In the next section we will examine phrase combinations that are not periods.

13.6 Phrase Groups and Phrase Chains

Phrase groups and phrase chains are not periods. In phrase groups and phrase chains, *the final cadence is a half cadence.* A **phrase group** consists of at least two phrases whose melodies begin similarly and has the final phrase ending in a half cadence. The terminology in this section draws from Douglass Green's *Form in Tonal Music.*

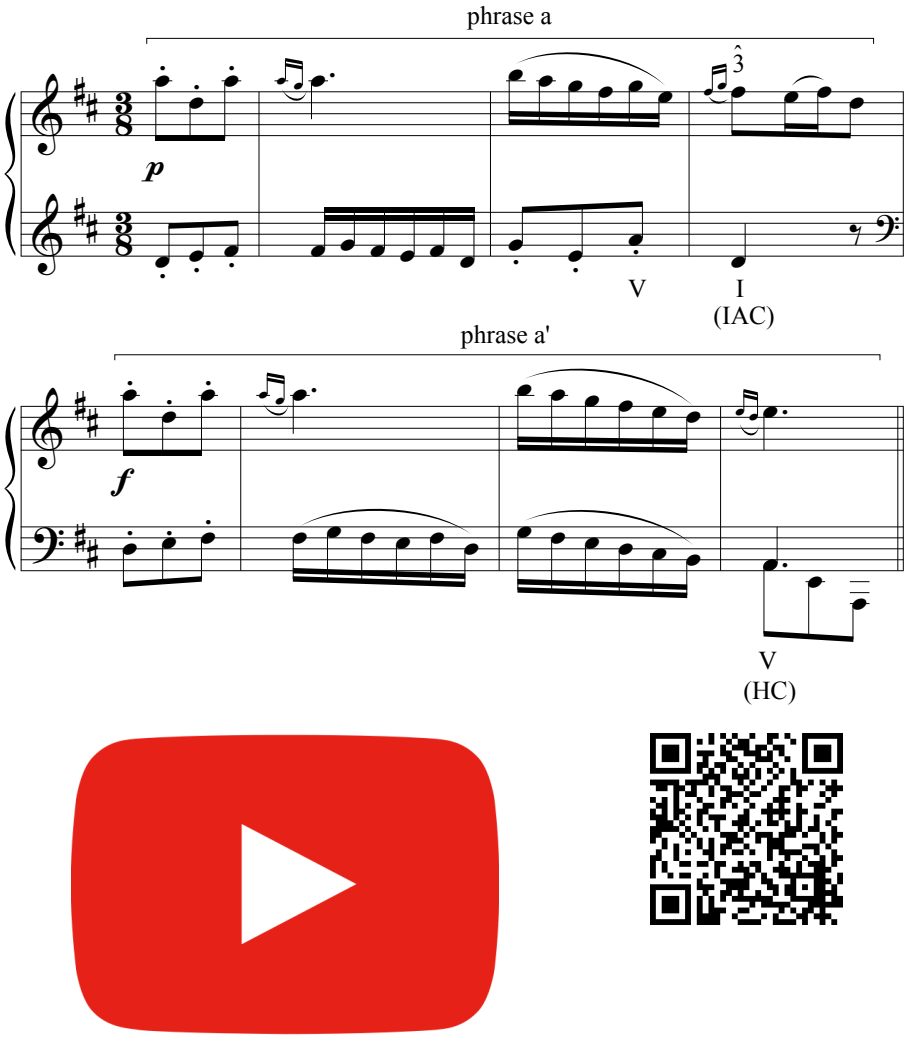


Figure 13.6.1 Franéois Couperin, 5 Pièces de Clavecin, 4. Le Petit-Rien (Ordre XIV, 8)

A **phrase chain** also ends in a half cadence and consists of at least two phrases with *contrasting* melodies.

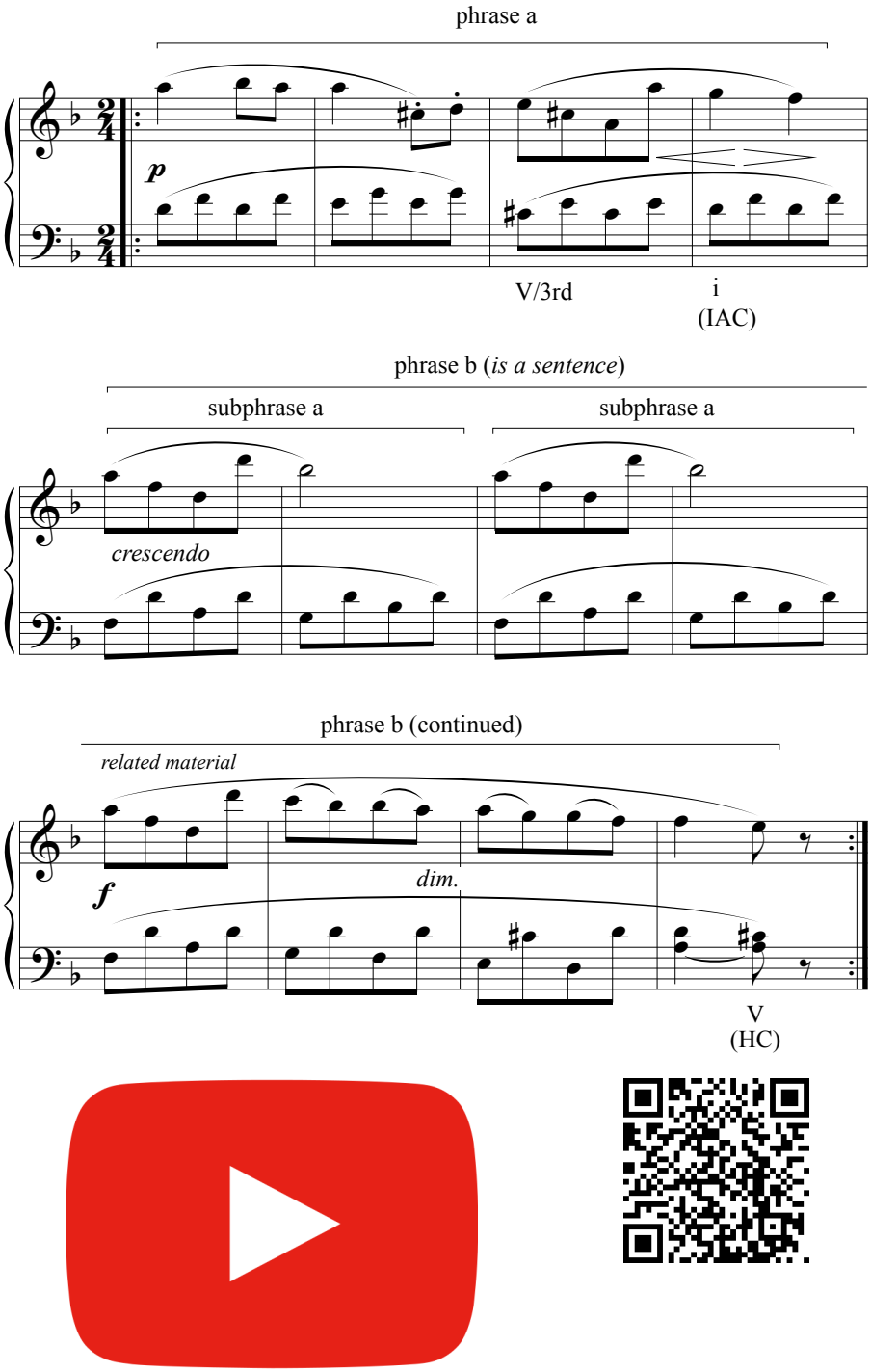


Figure 13.6.2 Beethoven, Sonatina in F, Anh. 5 No. 2, II. Rondo

13.7 The Elision

An **elision** is a special device for joining phrases together in an overlapping manner. In an elision, the final bar of one phrase is simultaneously the first bar of the next phrase.

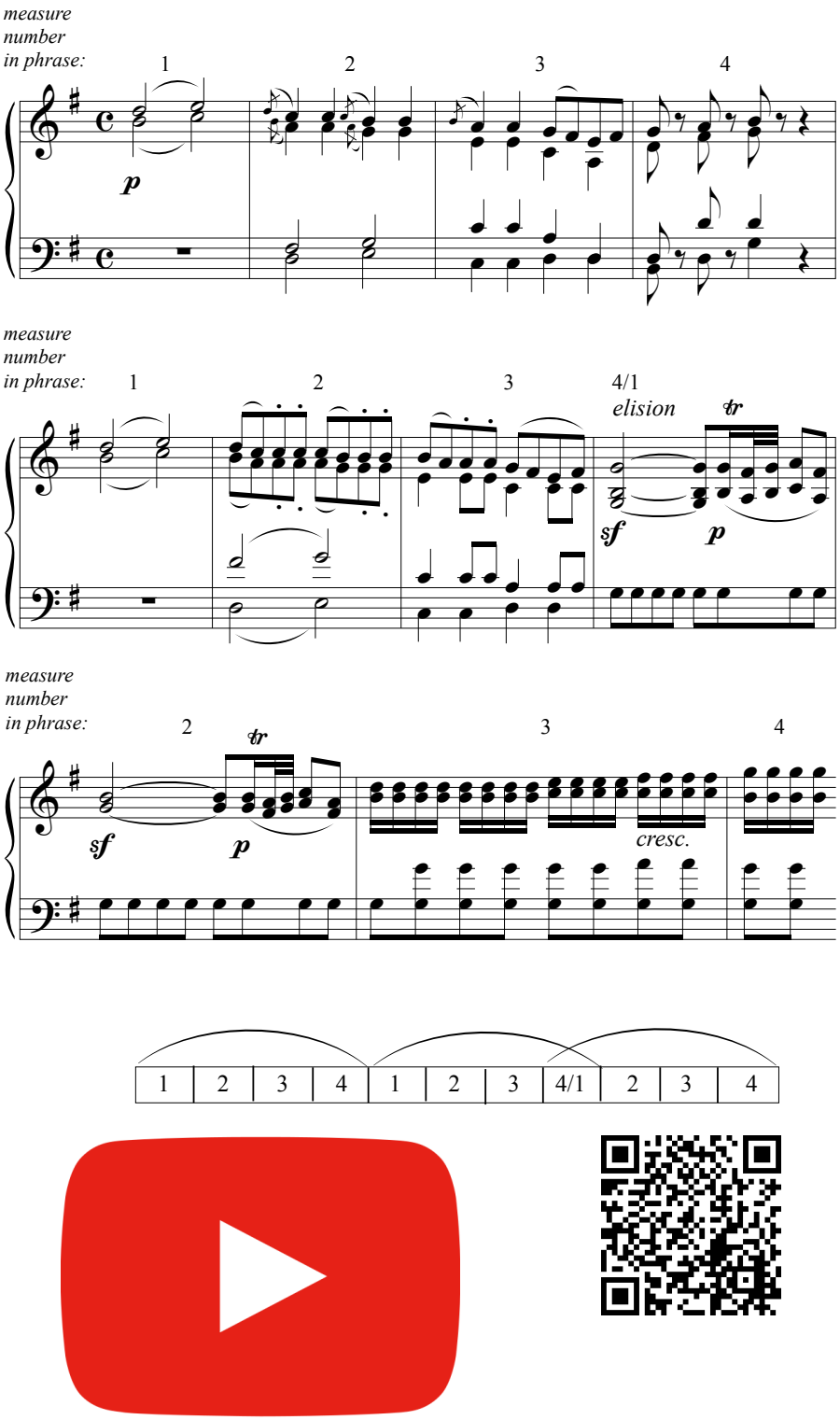


Figure 13.7.1 Mozart, *Eine kleine Nachtmusik*, K. 525, I.

13.8 Summary of Phrases in Combination

Table 13.8.1

Number of Phrases	*Form*	*Melodic Scheme*	*Cadence Info*
2 phrases	Parallel Period	*a a'*	Less conclusive then more conclusive
	Contrasting Period	*a b*	Less conclusive then more conclusive
	Phrase Group	*a a'*	Ends with HC
	Phrase Chain	*a b*	Ends with HC
	Repeated Phrase	*a a*	Same cadence twice
3 phrases	Asymmetrical period	*a a b* or *a b b*	Ends with most conclusive
	Phrase group	*a a b* or *a b b*	Ends with HC
	Phrase Chain	*a b c*	Ends with HC
4 phrases	Double Period	*a b a b'* or *a b a c* or *a a' a a″* or *a a' a b*	HC–HC–HC–AC or IAC–IAC–IAC–PAC or IAC–HC–IAC–PAC
	Repeated period	*a b a b* or *a b a c* or *a a' a a'*	Less conclusive then more conclusive formula repeated

13.9 Practice Exercises

For each excerpt below, do the following:

- Label chords with Roman numerals at the ends of phrases to determine cadences
- Label cadences by type (PAC, IAC, HC, PC, DC)
- Examine the motivic structure to determine if a phrase is a sentence
- Create a diagram of the form using cadence abbreviations (HC, DC, PC, IAC, and PAC) and letters to designate melody (*a*, *a'*, *b*, etc.). Use the "prime" symbol (') to show if a melody ends with a different cadence. In this chapter, the prime symbol should not be used to represent embellishment of the melody or changes in the harmonization or register.
- Name the form of the excerpt (sentence, parallel period, contrasting period, asymmetrical period, parallel double period, repeated phrase, repeated period).

1.

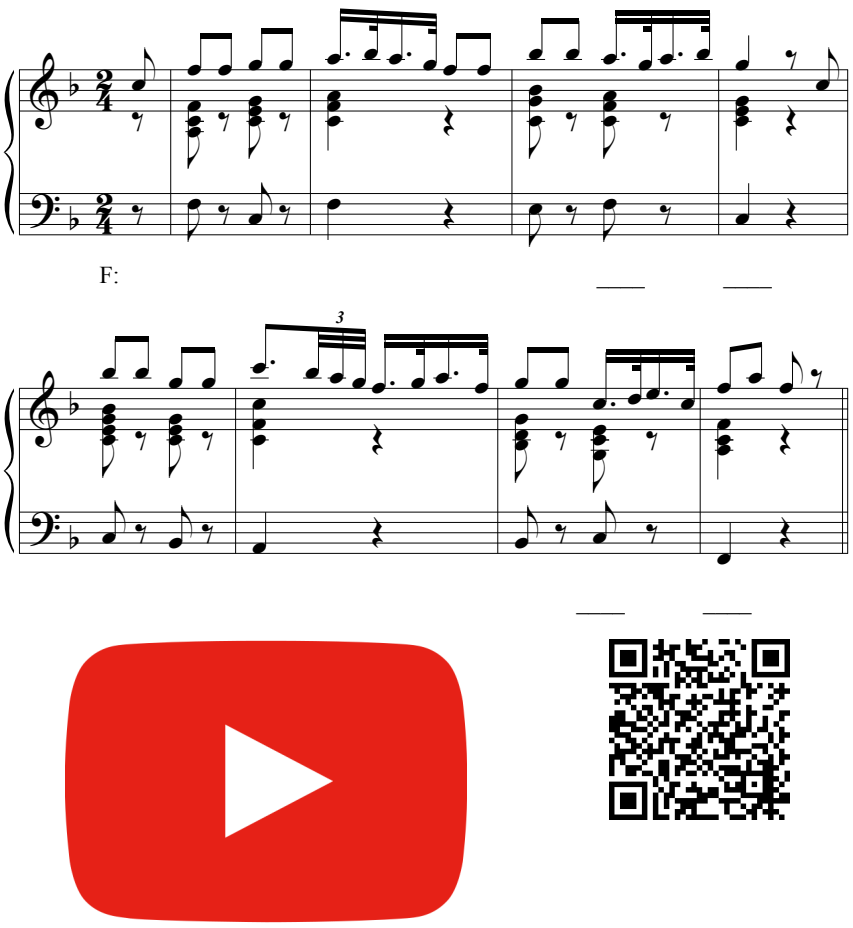


Figure 13.9.1

2.

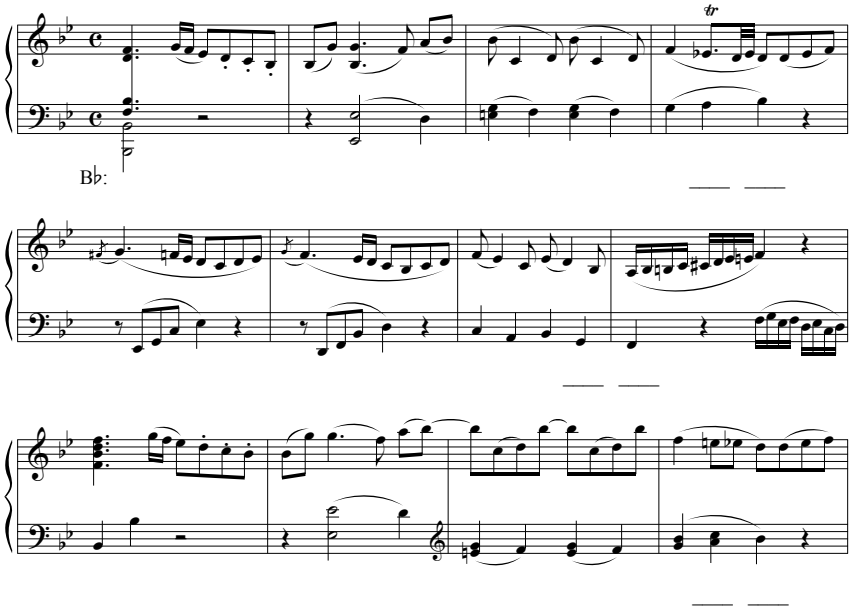


Figure 13.9.2

3.

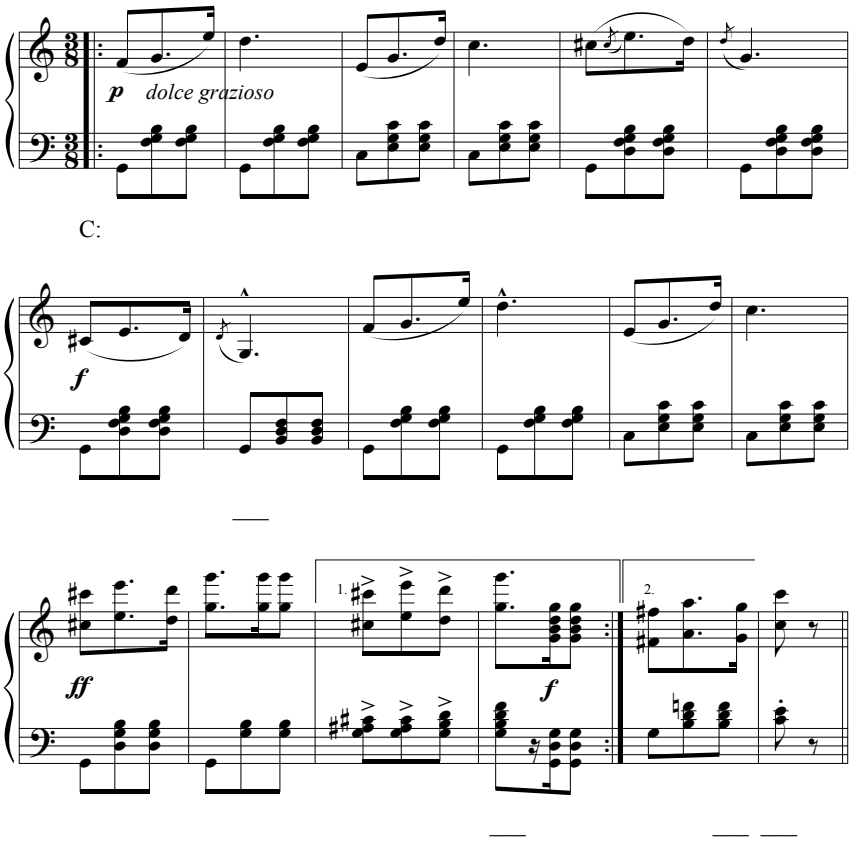


Figure 13.9.3

Click here to download the first homework assignment for this chapter.

Click here to download the second homework assignment for this chapter.

Click here to download the Unit 3 Practice Test.

PDF versions of the textbook, homework exercises, and practice exercises can be found at musictheory.pugetsound.edu

Chapter 14

Accompanimental Textures

In this chapter we will focus on common accompanimental textures. This chapter does not make an attempt to catalog every known accompanimental texture. Instead, it is meant to encourage you to listen to texture more closely and increase your musical awareness.

14.1 Texture

We will consider **texture** in terms of vertical and horizontal elements. The vertical nature of texture relates to the number of notes occurring simultaneously as harmonies. It could also relate to the number of voices or instruments performing melodies simultaneously in a contrapuntal texture. The horizontal element of texture relates to rhythmic activity: is the most common rhythmic value in a passage a slow or fast one?

To illustrate, here is a texture with chords (vertical elements) containing five voices with a melody (a sixth voice) above. Notice that the texture has slow rhythmic values on the horizontal plane.

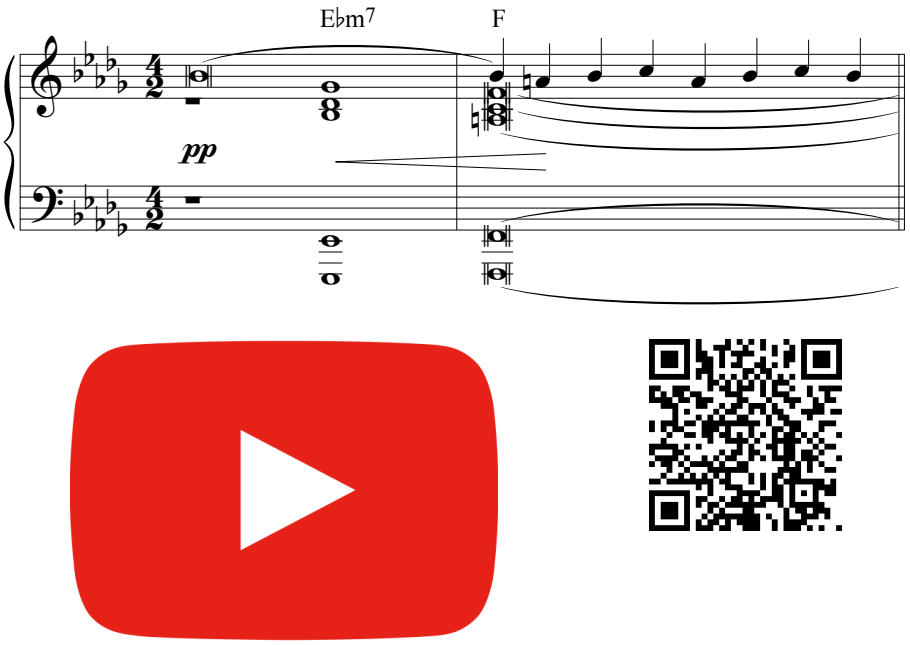


Figure 14.1.1 Samuel Barber, *Adagio for Strings* (1936)

Our second example is an excerpt for four instruments—a string quartet. While this a four-voice texture, it is full of rhythmic activity. The most common rhythmic value is the sixteenth note, and the syncopated figures in measures 3–4 of the Violin I part and measures 5–6 of the Viola part add to the textural complexity.

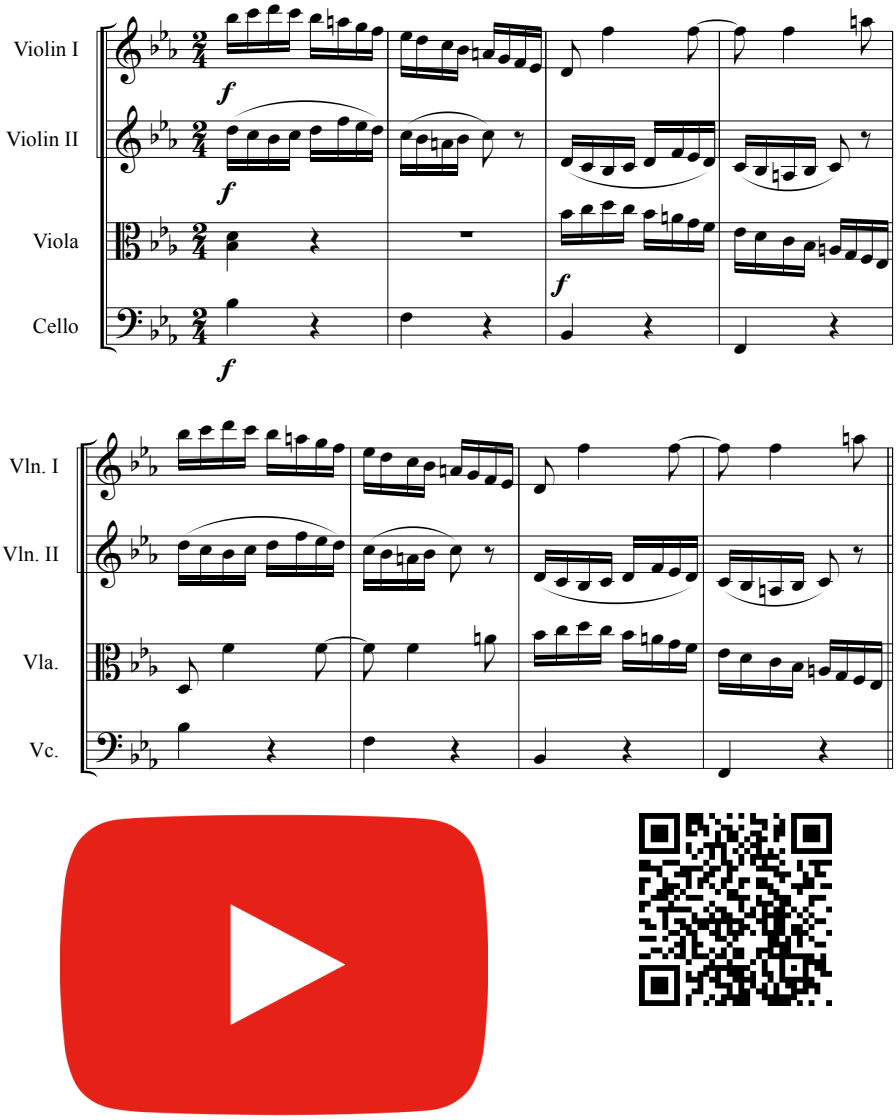


Figure 14.1.2 Mozart, String Quartet K. 428, IV (1783)

In the following sections, we will examine fairly straightforward melody-and-accompaniment textures in classical and popular music. In later chapters we will explore more complex textures.

14.2 Chorale Texture

Chorale textures are those in which there is a chord for every (or nearly every) melody note. A familiar example of chorale texture is the "Star-Spangled Banner."

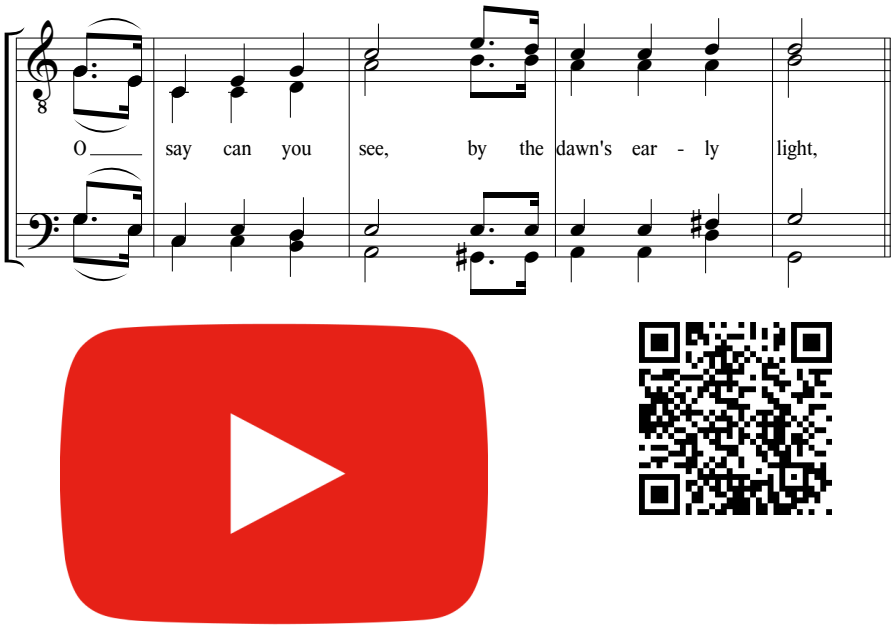


Figure 14.2.1 Francis Scott Key and John Stafford Smith, "The Star-Spangled Banner" (1814)

In the following example by Schubert, the melody at times moves in a slightly different rhythm that the chords below.

Figure 14.2.2 Franz Schubert, *Winterreise*, D.911, "Die Nebensonnen" (1828)

Chorale textures are also described as "homorhythmic" because all of the parts move in the same rhythm.

Figure 14.2.3 Jeff Bhasker, Nate Ruess, Andrew Dost, Jack Antonoff, "Some Nights" (2011)

In the next section we will examine arpeggiated accompaniments.

14.3 Arpeggiated Accompaniments

14.3.1 Arpeggios

One way to express chords rhythmically is through arpeggios in one part and a bass line in octaves in a lower part, as in the following example from Beethoven's *Moonlight Sonata*.

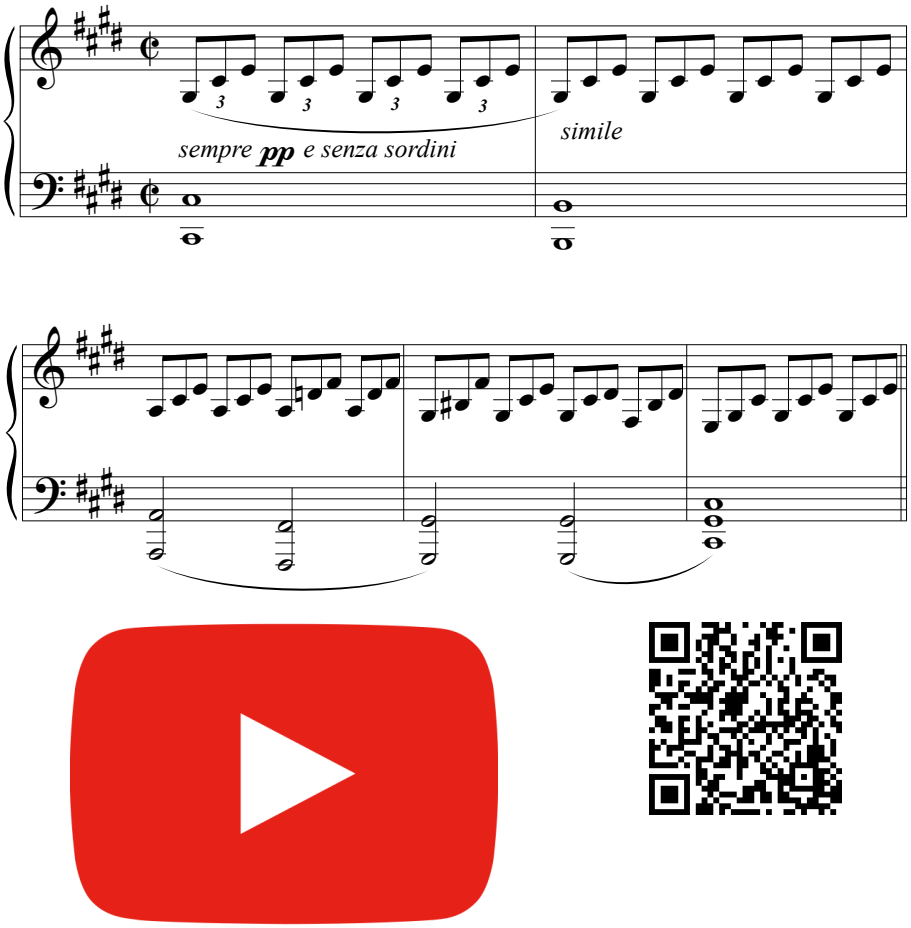


Figure 14.3.1 Ludwig van Beethoven, *Moonlight Sonata*, Op. 27, No. 2, I (1802)

The next example has descending arpeggios.

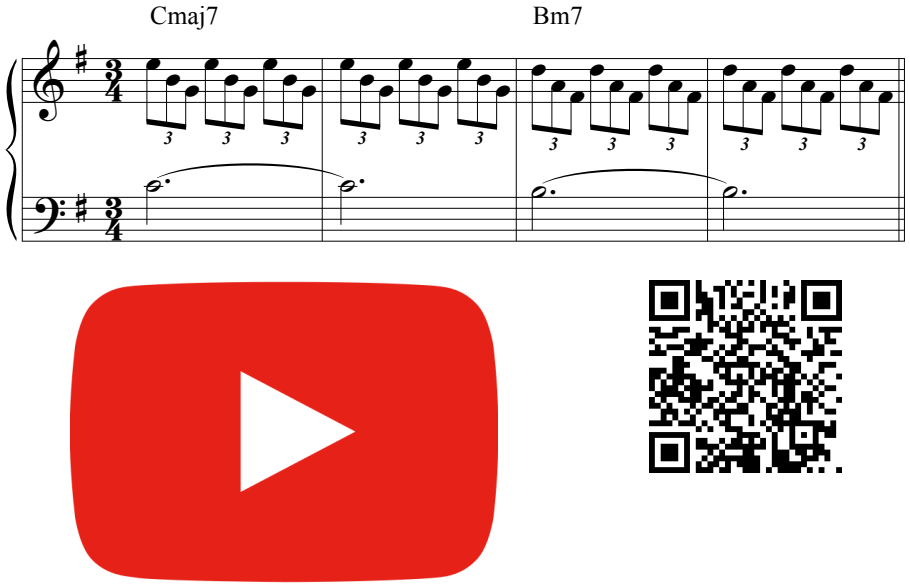


Figure 14.3.2 Alicia Keys, "If I Ain't Got You" (2004)

Notice that in both the Beethoven and Alicia Keys examples there is the harmonious interval of a tenth (an octave plus a third) between the bass (lowest) voice and the soprano (highest) voice.

The following examples have arpeggios that ascend and descend through a chord.

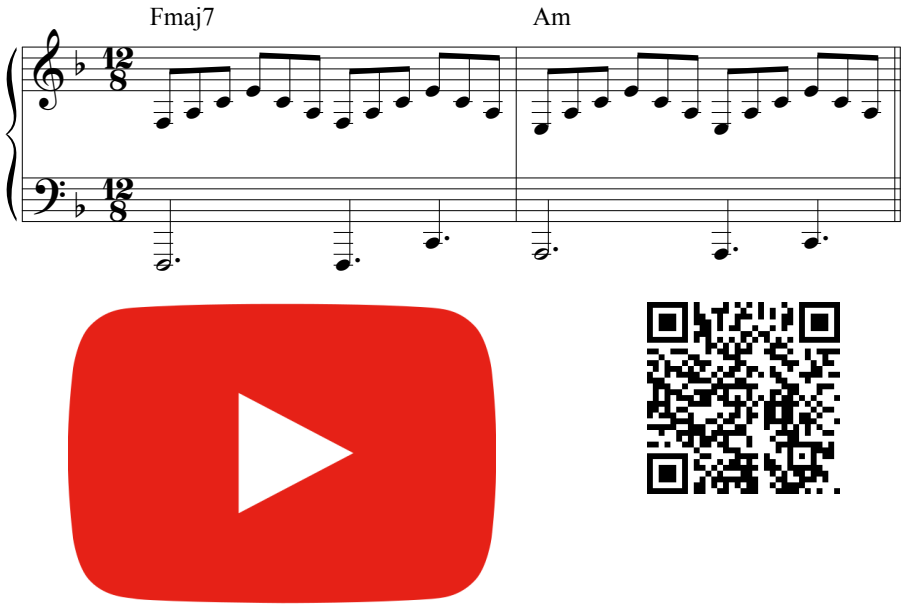


Figure 14.3.3 James Pankow, "Colour My World" (1970)

Figure 14.3.4 Fred Ball, Joseph Angel, and Robyn Fenty, "Love on the Brain" (2016)

Notice in the above example that there is also an organ playing block chords to create a sense of legato in the texture.

The next two examples are from more recent popular music.

Figure 14.3.5 Adele Adkins and Dan Wilson, "Someone Like You" (2011)

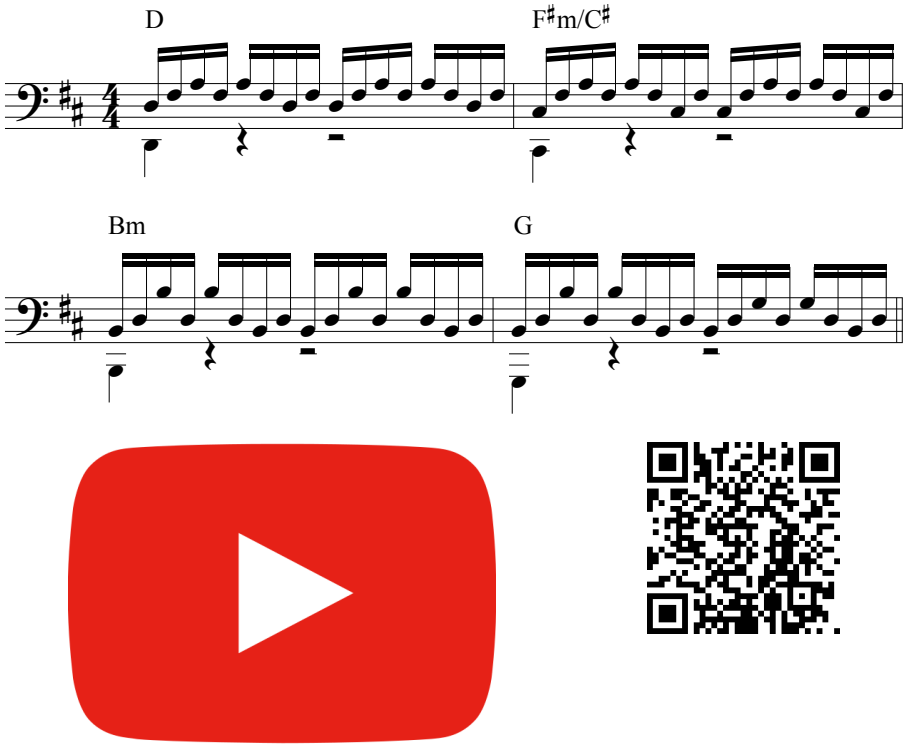


Figure 14.3.6 Ryan Tedder, "Secrets" (2009)

Below is an example in $\frac{4}{4}$ with arpeggios in sixteenth notes.

Figure 14.3.7 Kevin Briggs, Kandi Burress, Tameka Cottle, Lisa Lopes, "No Scrubs" (1999)

14.3.2 Alberti Bass

Alberti bass accompaniment patterns involve arpeggios that do not arpeggiate chords in a simple upward or downward motion, but in a "low–high–middle–high" pattern as you can see in the examples below.

Figure 14.3.8 Mozart, Piano Sonata K. 545, I (1788)

The next example uses the same Alberti pattern as in the Mozart example above, but transposed to E minor and in a lower register.

Figure 14.3.9 Brian Carman and Bob Spickard, “Pipeline” (1962)

14.4 Block Chord Accompaniments

This section contains the following subsections below:

- The “1 (2) &” rhythm
- The “Barbara Ann” Rhythm
- Repeated 8th-note Chords
- Repeated Quarter-note Chords

14.4.1 The “1 (2) &” Rhythm

In this section, we will discuss some accompanimental rhythms that occur frequently in popular music. The first such rhythm has two chords per measure, with the first chord on beat 1 and the second chord on the upbeat after beat 2.

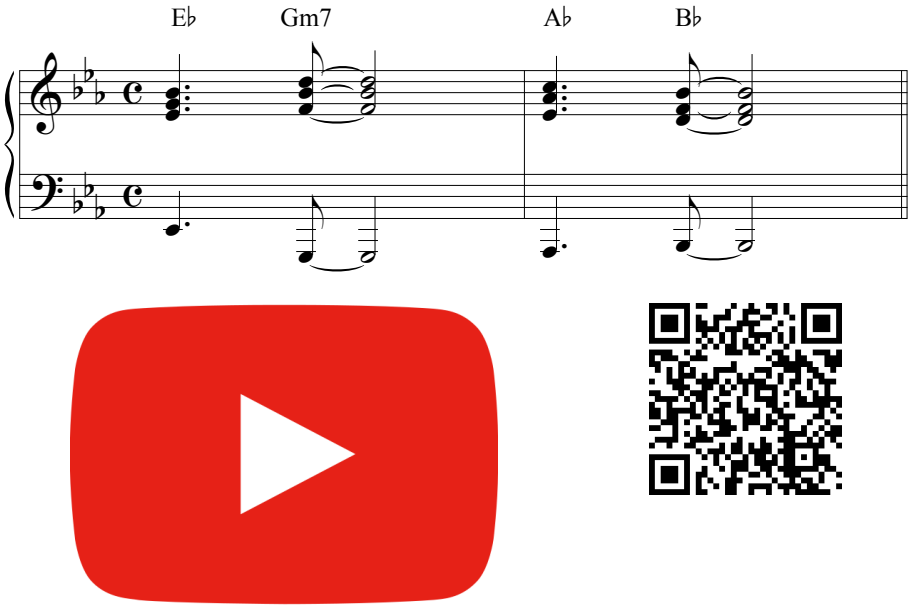


Figure 14.4.1 Marvin Gaye and Ed Townsend, "Let's Get It On" (1973)

You will find a similar rhythm and bass line in the next example.

Figure 14.4.2 Ed Sheeran, "Thinking Out Loud" (2014)

The "1 (2) &" rhythm is also found in "Don't You (Forget About Me)," a song associated with the film *The Breakfast Club*.

Figure 14.4.3 Keith Forsey and Steve Schiff, "Don't You (Forget About Me)" (1985)

Below are five more examples of block chord accompaniment in the "1 (2) &" rhythm.

Figure 14.4.4 Holly Knight, Gene Bloch, Ann Wilson, and Nancy Wilson, "Never" (1985)

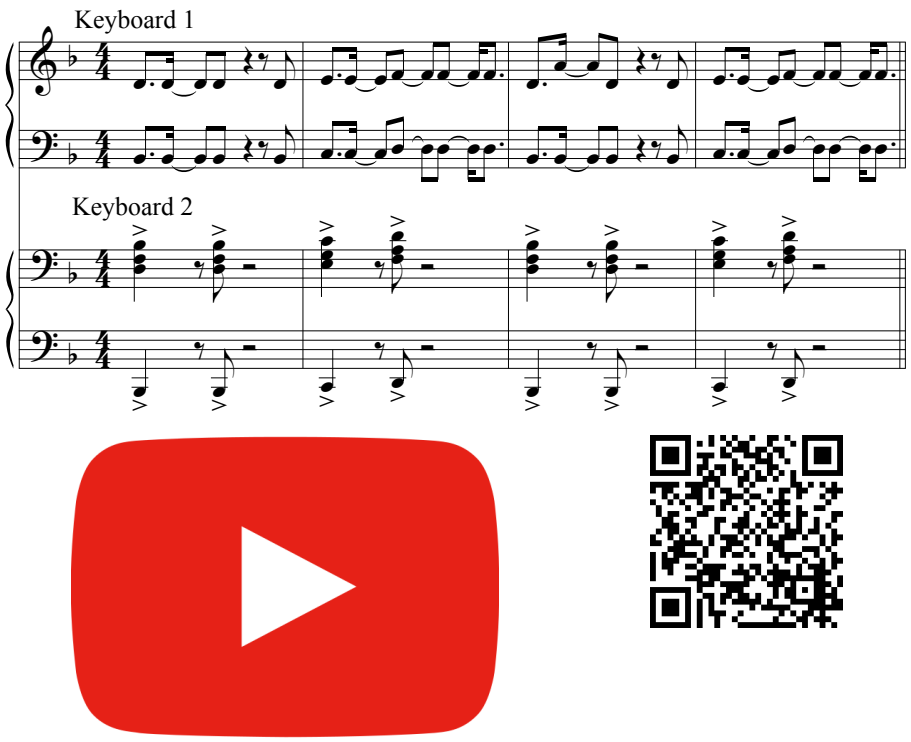


Figure 14.4.5 Kesha Sebert, Lukasz Gottwald, Benny Blanco, "Tik Tok" (2009)

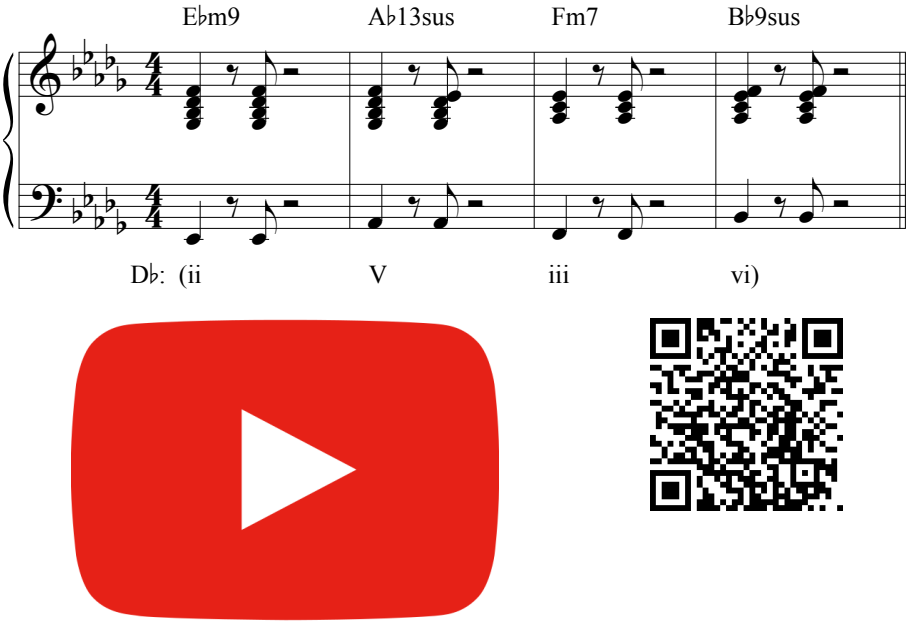


Figure 14.4.6 Bruno Mars, Philip Lawrence, Christopher Brown, James Fauntleroy, Johnathan Yip, Ray Romulus, Jeremy Reeves, Ray McCullough II, "That's What I Like" (2017)

Notice that the example above ("That's What I Like") has the same progression as "September" by Earth, Wind, and Fire.

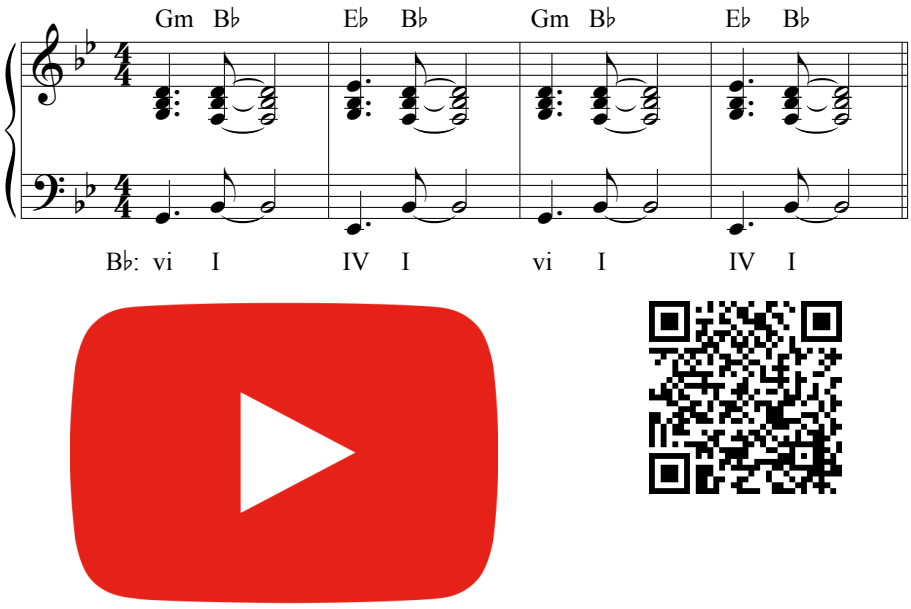


Figure 14.4.7 Charlie Puth, Cameron Thomaz, Andrew Cedar, Justin Franks, Dann Hume, Josh Hardy, and Phoebe Cockburn, "See You Again" (2015)

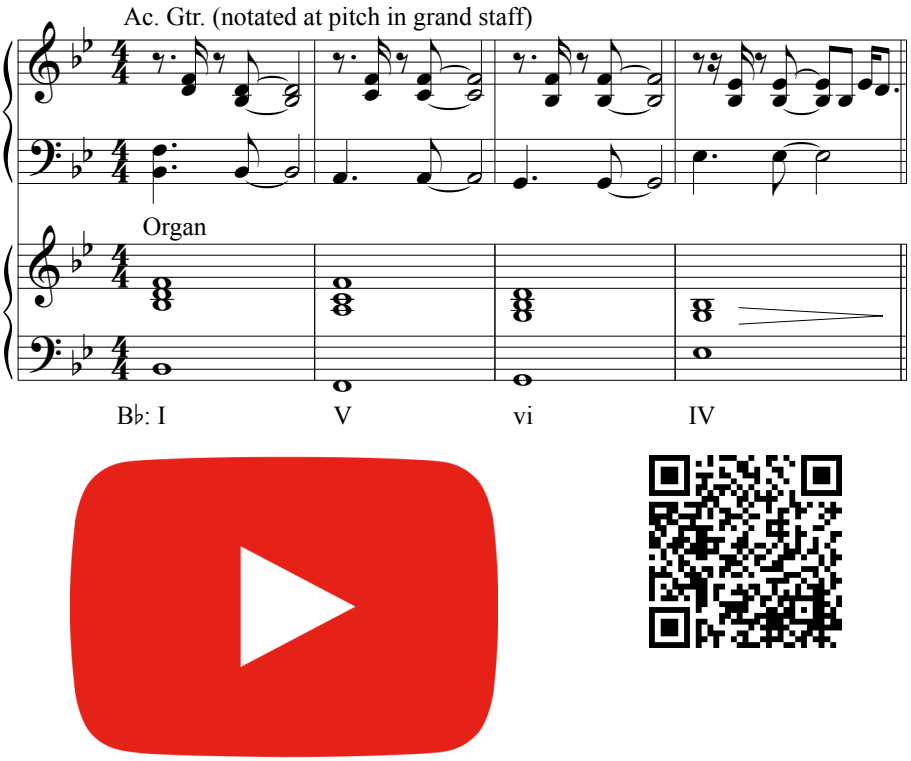


Figure 14.4.8 James Arthur, Neil Ormandy, Steve Solomon, "Say You Won't Let Go" (2016)

The example below has the "1 (2) &" rhythm in diminution.

Figure 14.4.9 Justin Bieber, Benny Blanco, and Ed Sheeran, "Love Yourself" (2015)

14.4.2 The "Barbara Ann" Rhythm

It is easier to describe the next block chord accompaniment pattern as the "Barbara Ann" rhythm than the "1 2 3 (4) & (1) & (2) & 3" rhythm. Below are six examples of pieces that use this rhythm, whether with block chords or solely in the bass line.

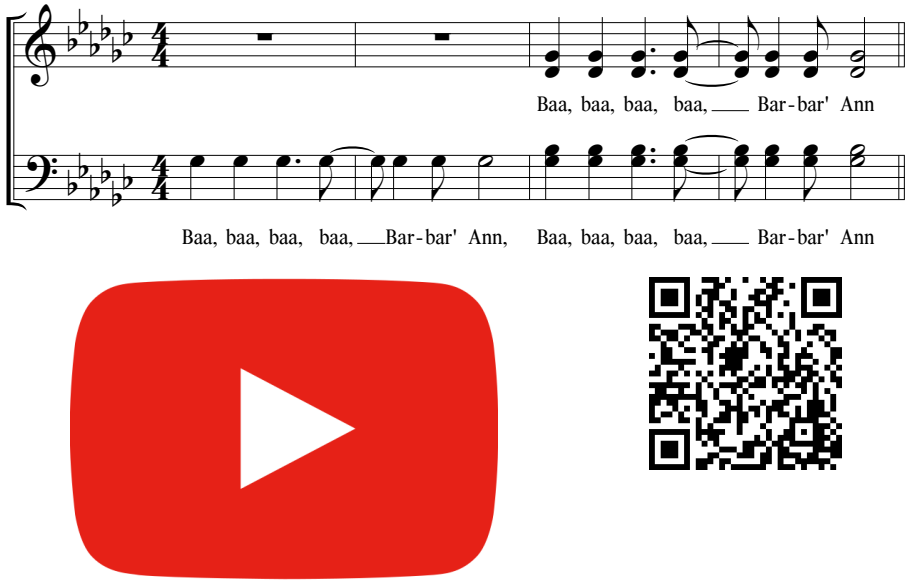


Figure 14.4.10 Fred Fassert, "Barbara Ann" (1961)

Figure 14.4.11 Brian Holland, Lamont Dozier, Eddie Holland, "You Can't Hurry Love" (1966)

Figure 14.4.12 Sara Allen, Daryl Hall, and John Oates, "Maneater" (1982)

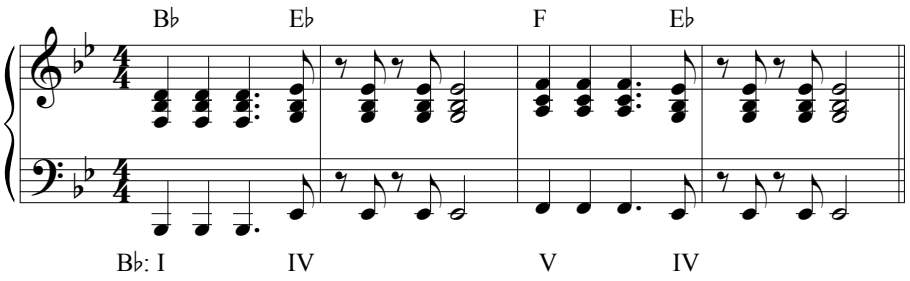


Figure 14.4.13 Kimberley Rew, "Walking On Sunshine" (1985)

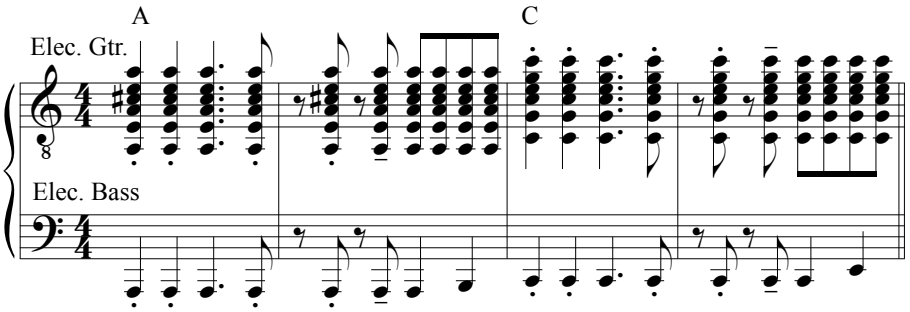


Figure 14.4.14 Nic Cester and Cameron Muncey, "Are You Gonna Be My Girl" (2003)

A slower version of this rhythm occurs in Deep Purple's "Smoke on the Water."

Figure 14.4.15 Ritchie Blackmore, Ian Gillan, Roger Glover, Jon Lord, and Ian Paice, "Smoke on the Water" (1973)

14.4.3 Repeated 8th-note Chords

Repeated 8th-note chords occur regularly in "classical" music textures.

Figure 14.4.16 W.A. Mozart, Piano Sonata K. 310, I (1778)

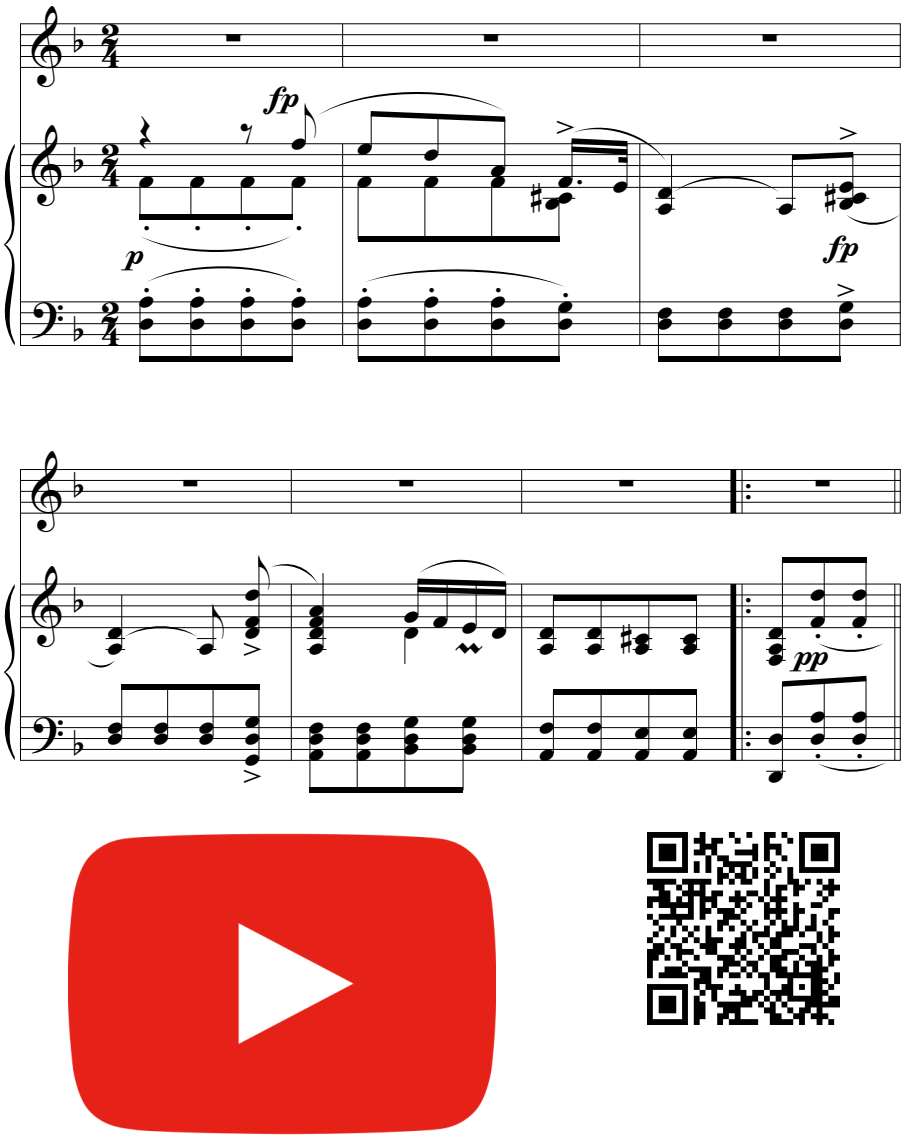


Figure 14.4.17 Franz Schubert, *Winterreise*, D. 911"Gute Nacht" (1828)

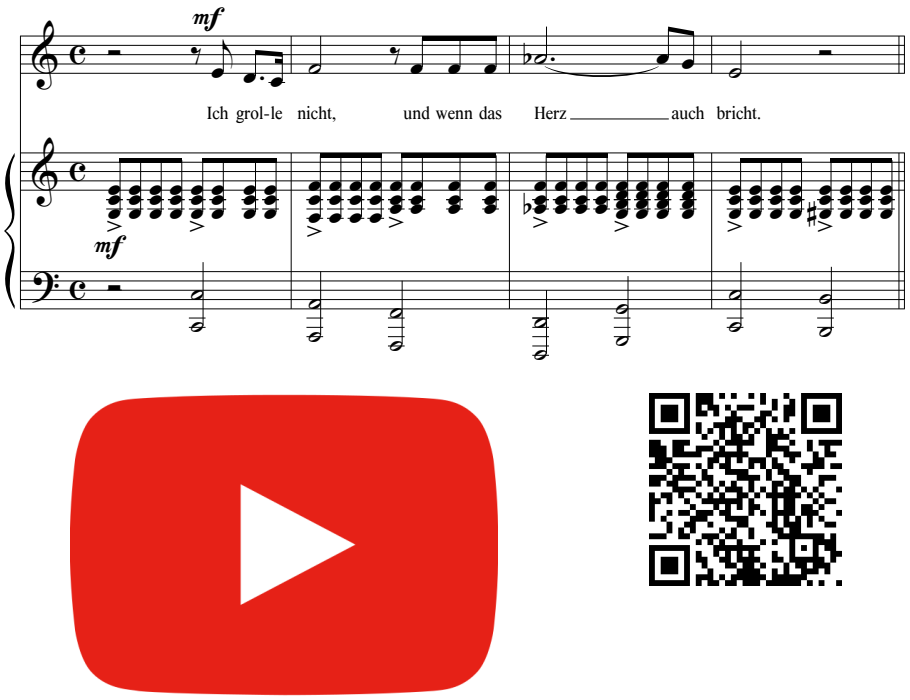


Figure 14.4.18 Robert Schumann, *Dichterliebe*, "Ich grolle nicht" (1844)

The next example is from the musical *Annie*. Note the "1 (2) &" rhythm in the bass line.

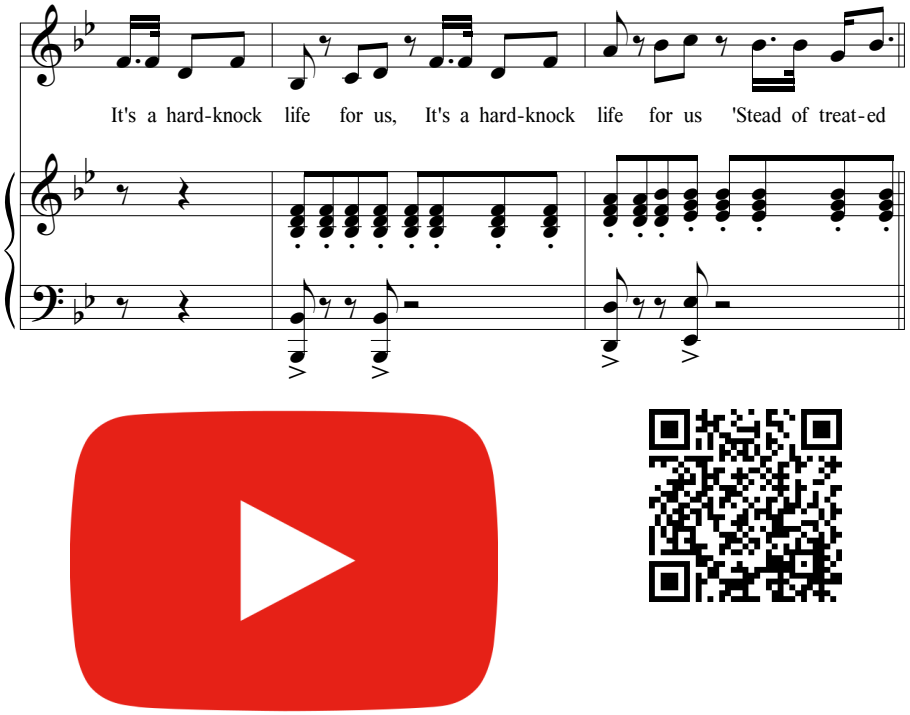


Figure 14.4.19 Charles Strouse and Martin Charnin, *Annie*, "It's the Hard Knock Life" (1977)

Repeated eighth notes are a standard accompanimental texture in rock.

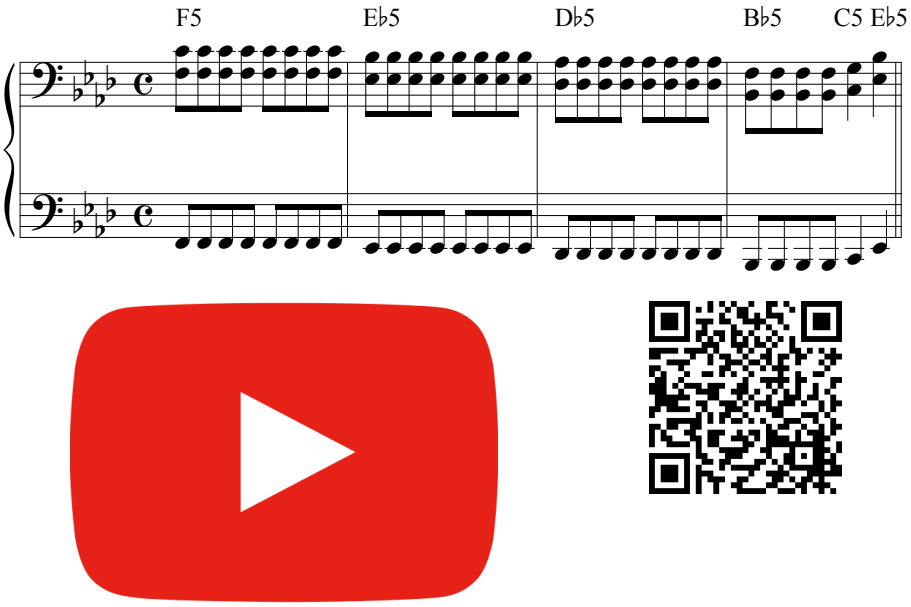


Figure 14.4.20 Geoff Gill and Cliff Wade, "Heartbreaker" (1979)

The repeated eighth-note rhythm is also common in recent popular music. Note that the following example uses the 1950's progression (i.e., I–vi–IV–V).

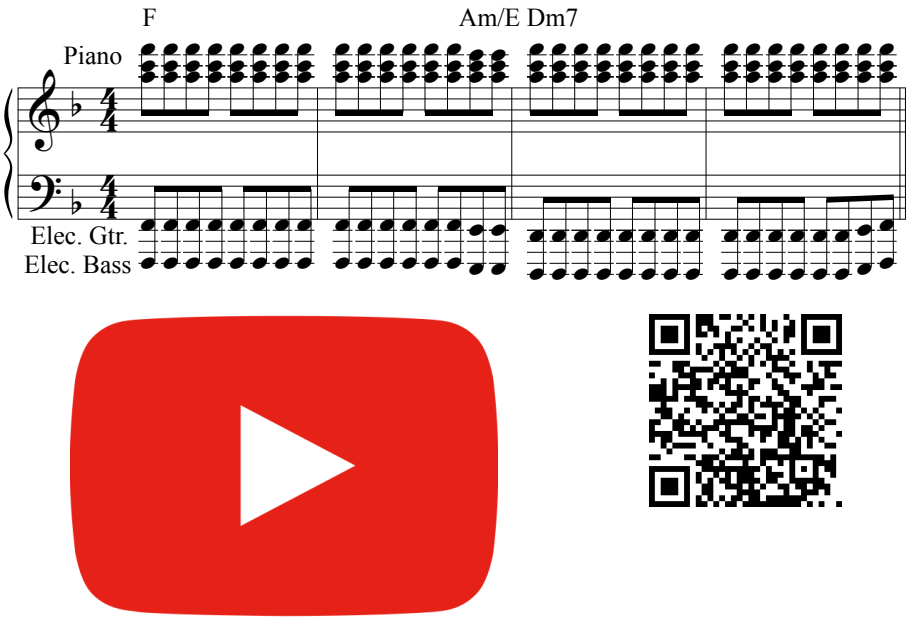


Figure 14.4.21 Nate Ruess, Andrew Dost, Jack Antonoff, and Jeff Bhasker, "We Are Young" (2011)

14.4.4 Repeated Quarter-note Chords

Repeated quarter-note chords are a common accompanimental rhythm in "classical" and popular music.

Figure 14.4.22 George Frideric Handel, "Ombra mai fu," *Xerxes*, HWV 40 (1738)

Figure 14.4.23 Joe Raposo, Jon Stone, and Bruce Hart, "Can You Tell Me How to Get to Sesame Street?" (1969)

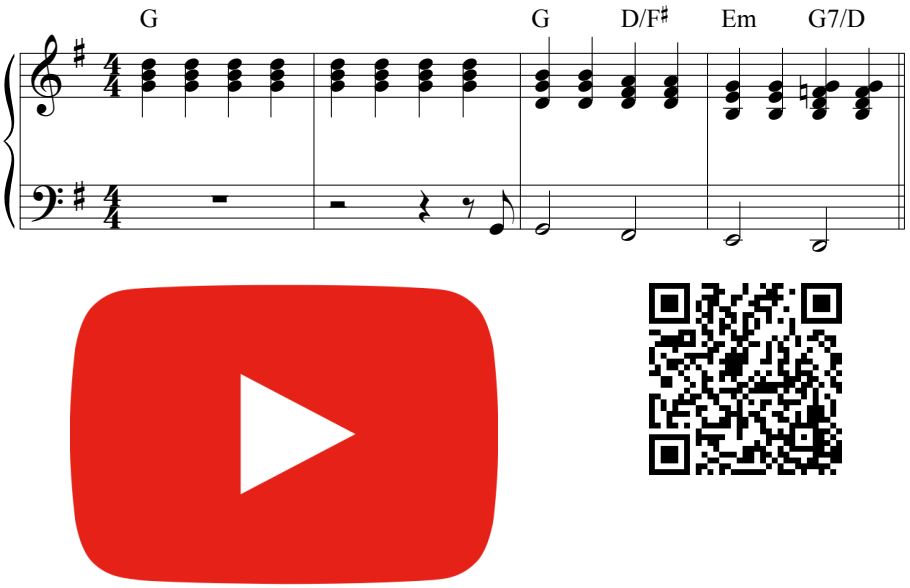


Figure 14.4.24 Billy Joel, "She's Got a Way" (1971)

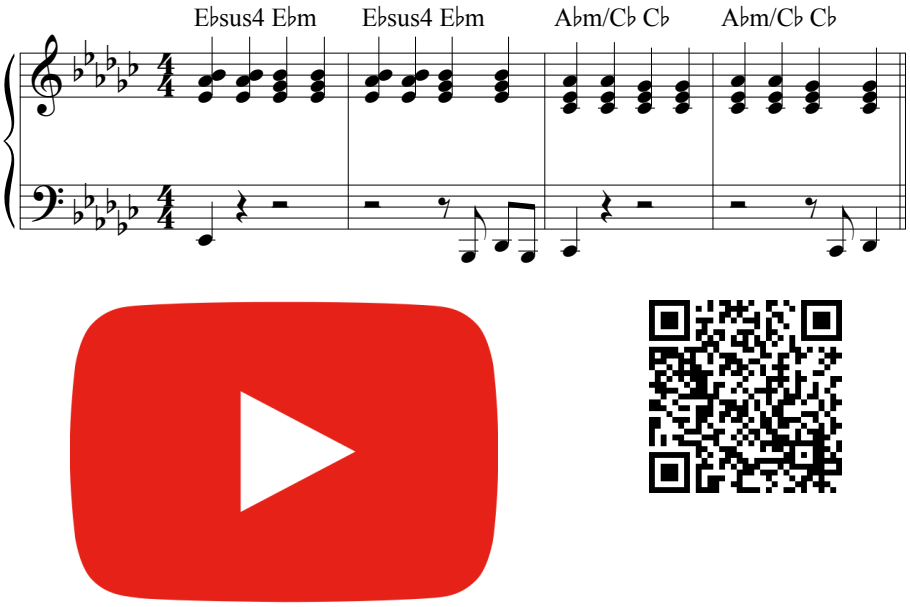


Figure 14.4.25 Lou Gramm and Mick Jones, "Cold As Ice" (1977)

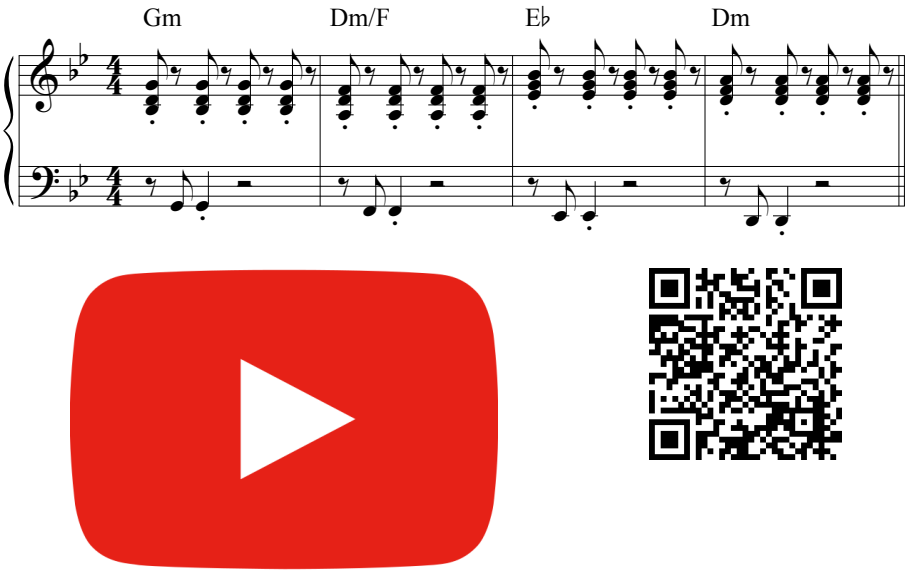


Figure 14.4.26 Gordon Sumner, "Roxanne" (1978)

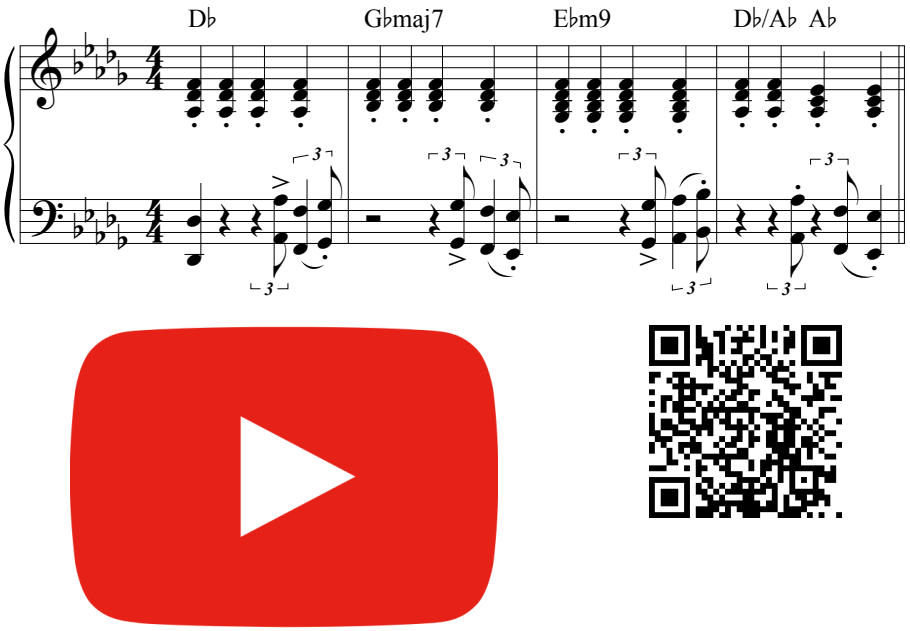


Figure 14.4.27 Michael Bublé, Alan Chang, and Amy Foster-Gillies, "Haven't Met You Yet" (2009)

Figure 14.4.28 Sara Bareilles, "Love Song" (2007)

In the next section, we will examine accompanimental textures consisting of afterbeats and offbeats.

14.5 Afterbeats and Offbeats

14.5.1 Afterbeats

The term "afterbeats" is from *Fundamentals of Musical Composition* by noted composer and pedagogue Arnold Schoenberg. "**Afterbeats**" are repeated chords (usually eighth notes, sometimes quarter notes) that occur after the downbeat.

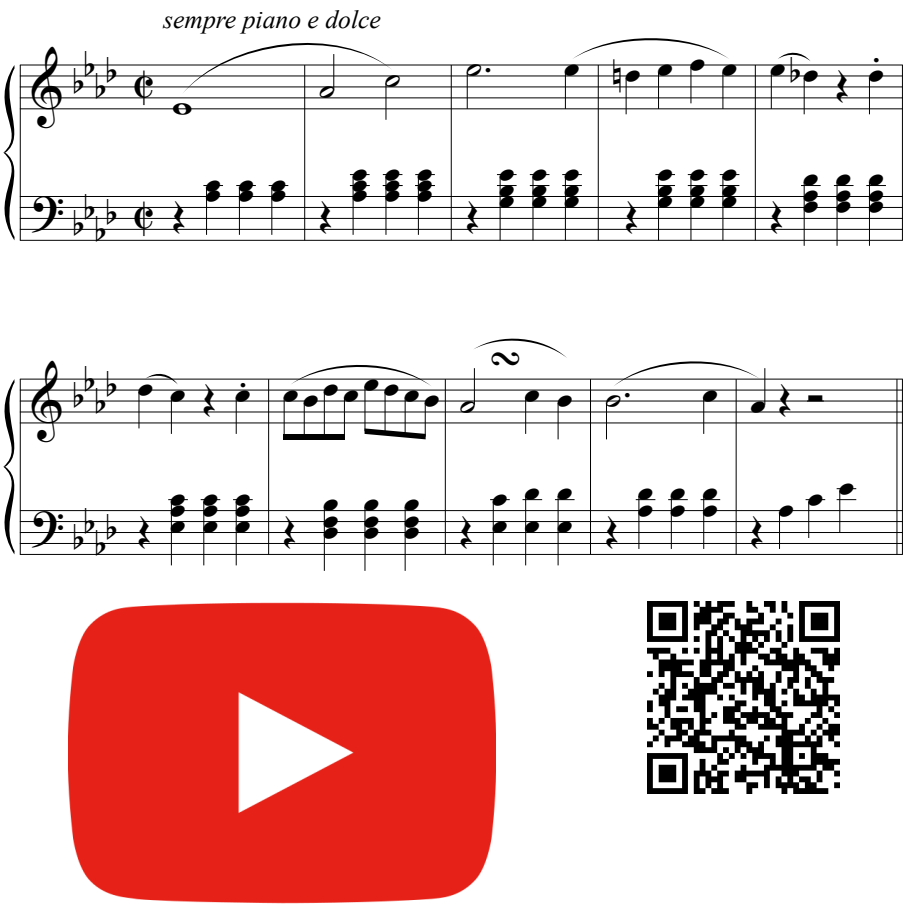


Figure 14.5.1 Ludwig van Beethoven, Piano Sonata Op. 2, No. 1, IV (1796)

In the next example, the afterbeats are not repeated chords but instead are passing-tone figures harmonized in thirds.

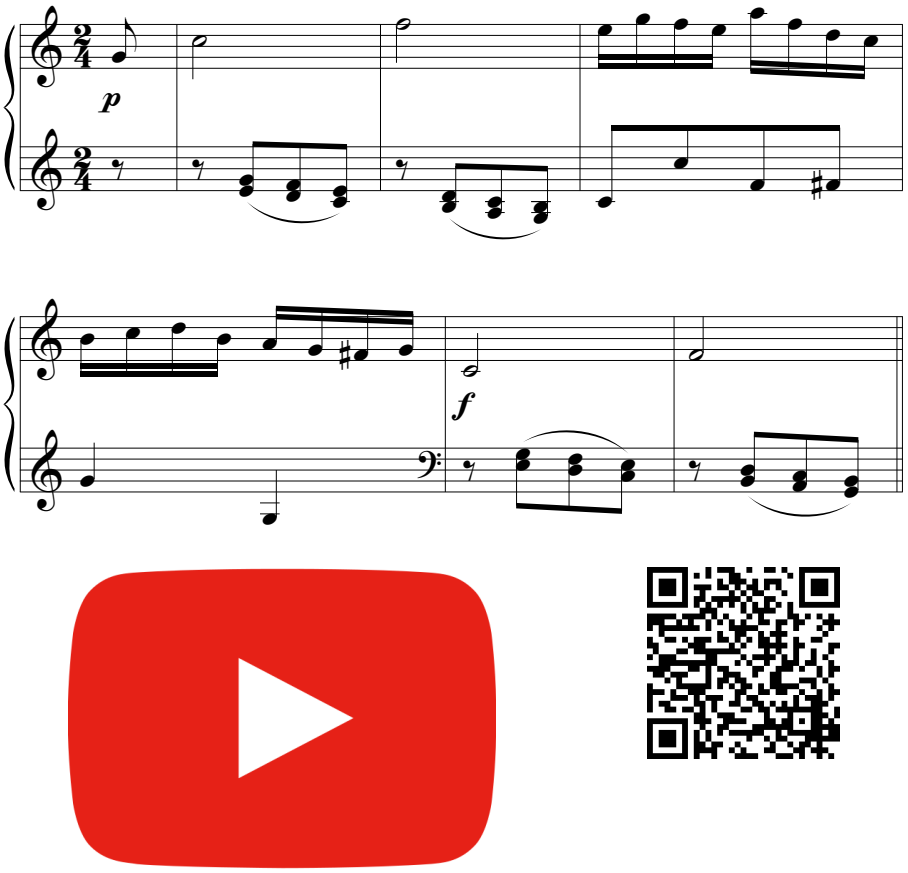


Figure 14.5.2 W.A. Mozart, Piano Sonata K. 279, III (1775)

14.5.2 Offbeats

Offbeats are typically chords that occur regularly on upbeats, avoiding downbeats. While there are many styles of music that use chordal offbeats, in this section we will consider only polka and reggae styles.

14.5.2.1 Polka

The polka, which originated in Bohemia, has connotations with Germary and *Oktoberfest*. The polka in the United States is often associated with Frankie Yankovic, who was known as the "Polka King."

Figure 14.5.3 Jaromír Vejvoda, "Beer Barrel Polka" (1927)

14.5.2.2 Reggae

Reggae is associated with the island of Jamaica and, in terms of texture, is characterized by offbeats, often played on an electric guitar. Bob Marley is closely associated with reggae music.

Figure 14.5.4 Bob Marley, "Could You Be Loved" (1980)

By the late 1970s, British bands like The Police and UB40 were recording songs that used the reggae accompanimental style.

Figure 14.5.5 Gordon Sumner, "Walking on the Moon" (1979)

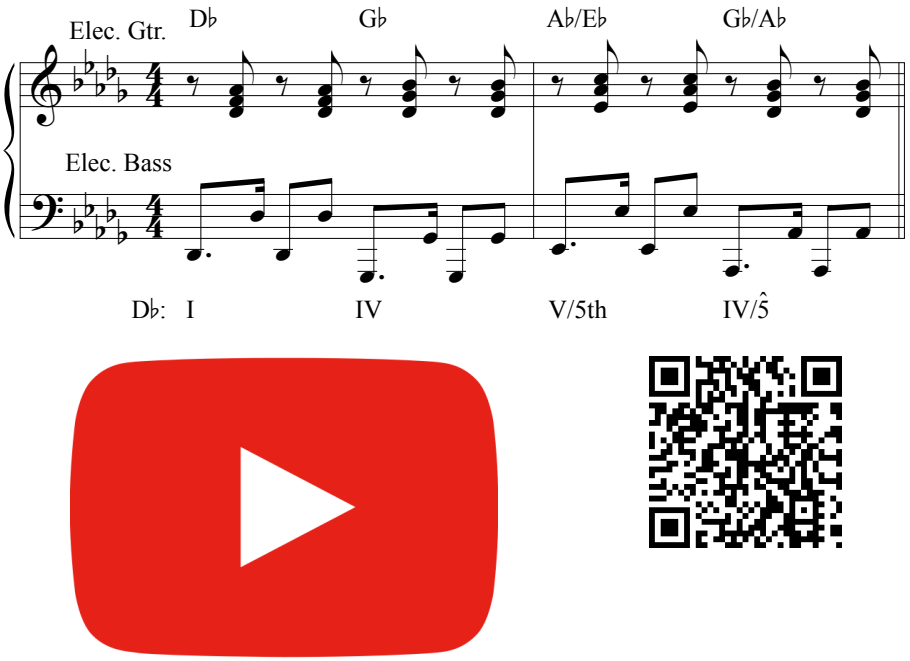


Figure 14.5.6 Neil Diamond, "Red Red Wine" (recorded in 1983 by UB40)

Reggae accompanimental texture is fairly common in the present day, as can be heard in the following examples.

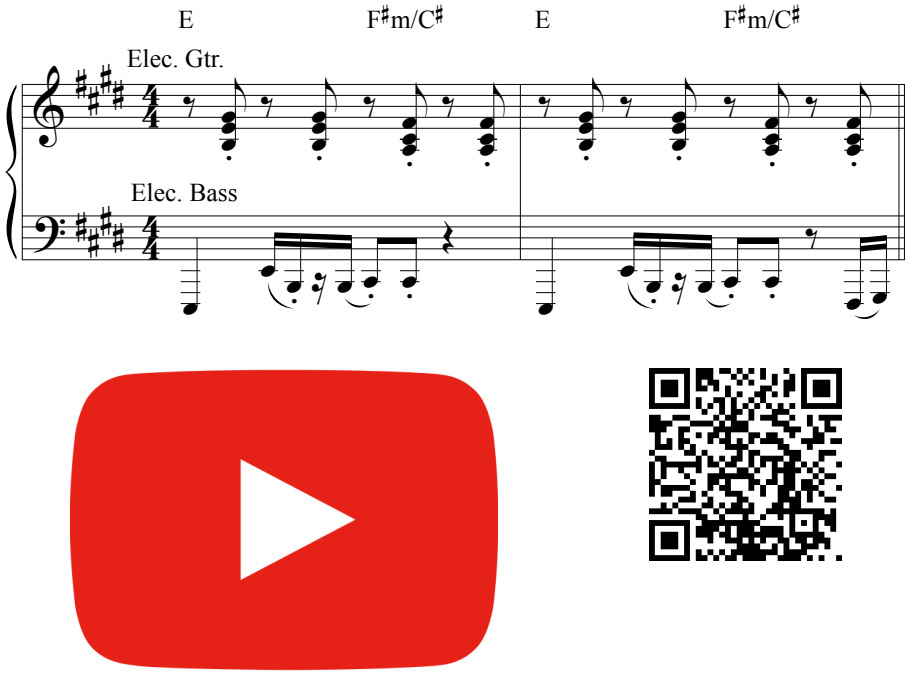


Figure 14.5.7 Gwen Stefani and David Stewart, "Underneath It All" (2001)

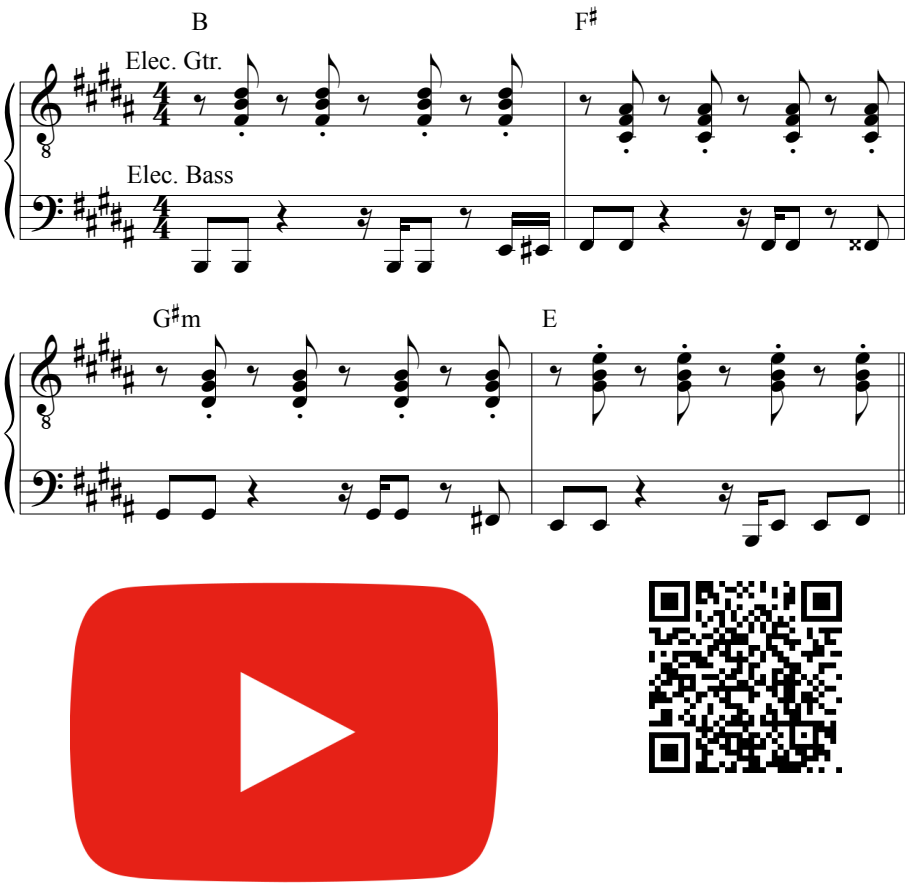


Figure 14.5.8 Jason Mraz, "I'm Yours" (2007)

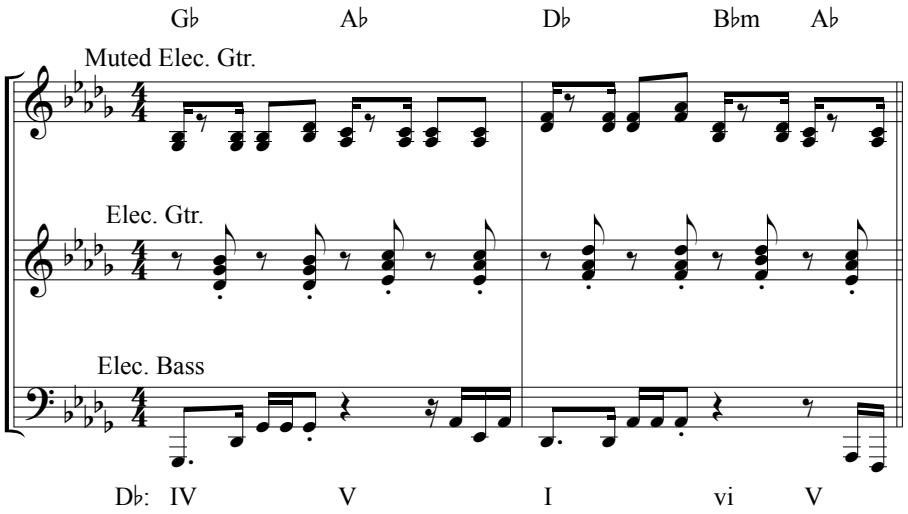
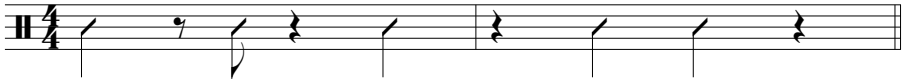


Figure 14.5.9 Nasri Atwey, Adam Messinger, Mark Pellizzer, Ben Spivak, Alex Tanas, "Rude" (2013)

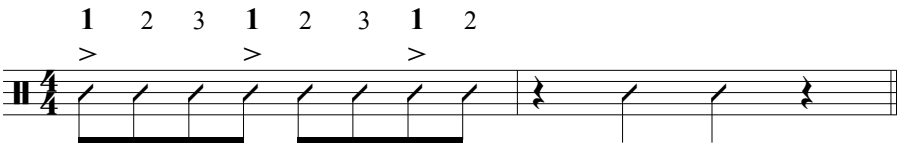
14.6 The 3–2 Son Clave

The 3–2 son clave (and the 2–3 son clave) are essential rhythmic elements in Afro-Cuban music. In this section we will see how cross rhythms implied by the 3–2 son clave can be viewed as a possible source of cross rhythms in popular music. Here is a video demonstration of a 3–2 son clave.

Here is rhythmic notation of a 3–2 son clave. Notice there are three attacks in the first measure and 2 attacks in the second bar.



The rhythm underlying the first bar is 3+3+2.



The 3–2 son clave has also been called the "Bo Diddley Beat" because of its use by Bo Diddley in the 1950s. Look at the rhythms shown above as you listen to the following examples.

Figure 14.6.1 Willie Dixon, "Pretty Thing"

Figure 14.6.2 Bert Berns, Bob Feldman, Jerry Goldstein, and Richard Gottehrer, "I Want Candy"

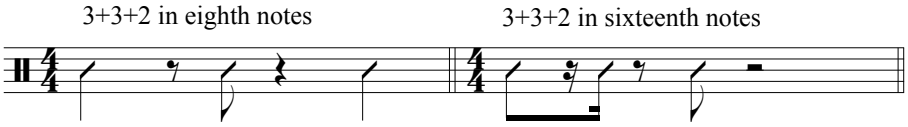
Figure 14.6.3 Russ Ballard, "New York Groove"

Figure 14.6.4 George Michael, "Faith"

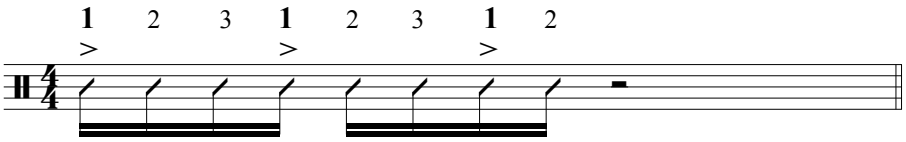
Figure 14.6.5 U2, "Desire"

14.6.1 The 3+3+2 Rhythm

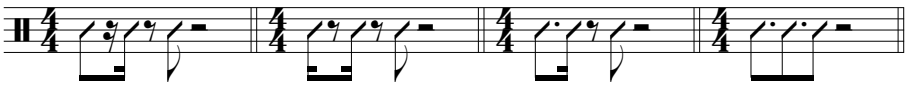
In the examples below, only the first bar of the 3–2 son clave is used. Below, the 3+3+2 rhythm is shown in both eighth notes and sixteenth notes. The sixteenth-note version is known as *tresillo*.



The example below shows the sixteenth-note subdivisions in the 3+3+2 rhythm.



Below are different ways of notating the sixteenth–note version 3+3+2 rhythm.



The first example, by the Rebirth Brass Band, uses a "second line" drumming pattern, which is associated with second line parades in New Orleans.

Figure 14.6.6 Reggie Calloway, "Casanova" (1987)

The well-known introduction to "Eye of the Tiger" uses the 3+3+2 rhythm.

Figure 14.6.7 Frankie Sullivan and Jim Peterik, "Eye of the Tiger" (1982)

In the following example from Cyndi Lauper's "Girls Just Want to Have Fun," the lead electric guitar riff emphasizes a 3+3+2 rhythm in 16th notes on each downbeat.

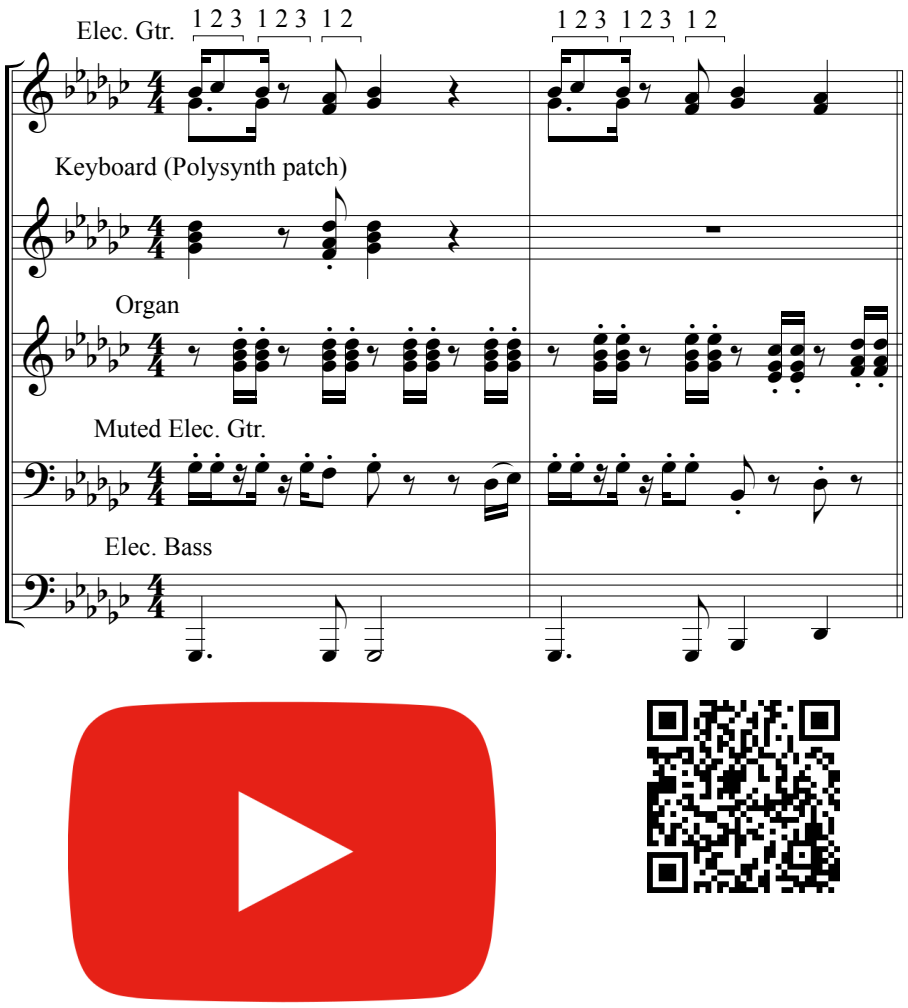
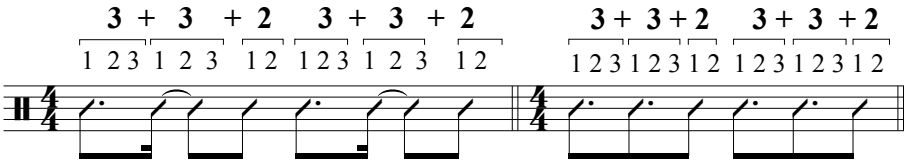


Figure 14.6.8 Robert Hazard, "Girls Just Want to Have Fun" (1983)

Below is an example showing the 3+3+2 rhythm (in 16th notes) immediately repeated. The rhythm is shown in two possible notations below.



The following three examples all use the (3+3+2)+(3+3+2) rhythm as a rhythmic ostinato or groove.

Figure 14.6.9 John Stephens and Toby Gad, "All of Me" (2013)

Notice that this progression is from the Best-Seller progression.

Figure 14.6.10 Shawn Mendes, Teddy Geiger, and Scott Harris, "Treat You Better" (2016)

Figure 14.6.11 Ed Sheeran, Steve Mac, Johnny McDaid, Kandi Burruss, Tameka Cottle, and Kevin Briggs, "Shape of You" (2017)

This rhythm also occurs in the following classical piece by Ligeti.

Figure 14.6.12 György Ligeti, Trio for Violin, Horn, and Piano, II (1982)

The following examples have the (3+3+2)+(3+3+2) rhythm in 8th notes.

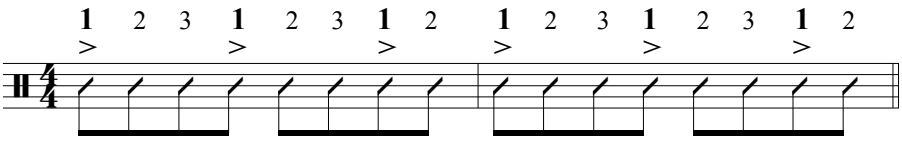


Figure 14.6.13 Guy Berryman, Jonny Buckland, Will Champion, and Chris Martin, "Clocks" (2003)

Figure 14.6.14 Grohl, Hawkins, Mendel, Shiflett, "Best of You" (2005)

Figure 14.6.15 Nasri Atwey, Adam Messinger, Mark Pellizzer, Ben Spivak, Alex Tanas, "Rude" (2013)

14.6.1.1 Habanera and Reggaeton

The reggaeton beat is built from a 3+3+2 rhythm. We will see a relationship between the reggaeton beat with the habanera. First, let us examine the famous "Habanera" bass line from the opera *Carmen*.

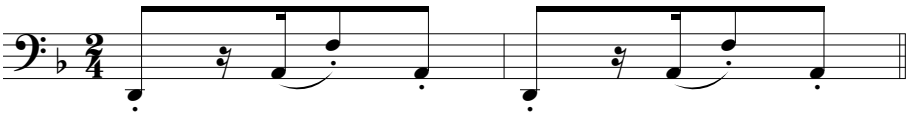
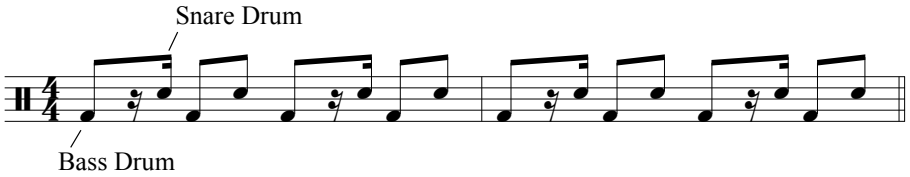
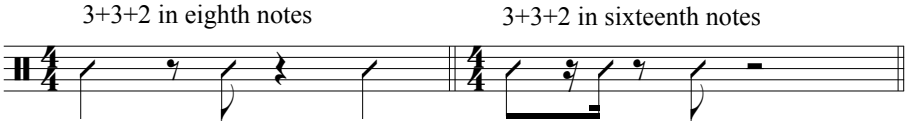


Figure 14.6.16 Georges Bizet, *Carmen*, Habanera ("L'amour est un oiseau rebelle") (1870)

Compare the habanera pattern above to the reggaeton beat below, notated for bass drum and snare drum.



Compare the "reggaeton" rhythm to the 3+3+2 of the first bar of a 3–2 son clave (refer to the second measure in the example below).



Here are examples of songs with a reggaeton beat.

Figure 14.6.17 Wycliffe Johnson and Cleveland Browne, "Dem Bow" (1990)

Figure 14.6.18 Aubrey Graham, Paul Jefferies, Noah Shebib, Ayodeji Balogun, Luke Reid, Errol Reid, Kyla Smith, Corey Johnson, "One Dance" (2016)

Figure 14.6.19 Luis Rodríguez, Erika Ender, and Ramón Ayala, "Despacito" (2017)

Notice that the progression for "Despacito" comes from the Best-Seller progression.

Figure 14.6.20 Bieber, Michaels, Tranter, Moore, and Tucker, "Sorry"

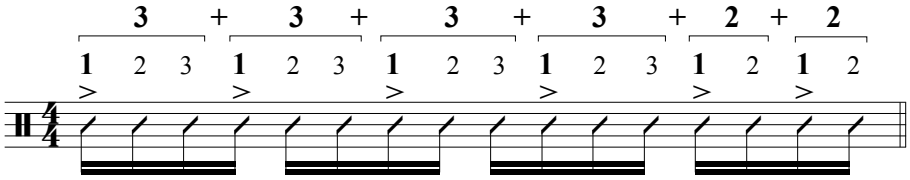
Figure 14.6.21 Karen Marie Ørsted, Jonnali Parmenius, and Uzoechi Emenike, "Final Song" (2016)

Figure 14.6.22 Adam Levine, John Ryan, Jacob Kasher Hindlin, Justin Tranter, and Phil Shaouy, "Cold" (2017)

In the next two sections, we will examine expansions of the 3+3+2 rhythm

14.6.2 3+3+3+3+2+2

In this section, we will see each number in the 3+3+2 pattern repeated, generating the 3+3+3+3+2+2 pattern.



Listen for the 3+3+3+3+2+2 rhythm in the following examples.

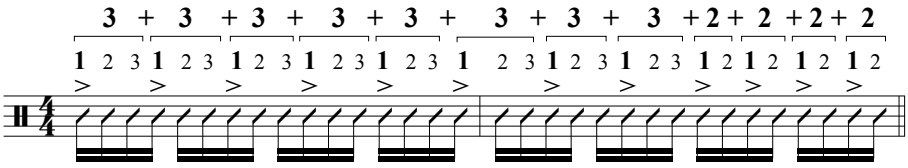
Figure 14.6.23 U2, "Beautiful Day" (2000)

Figure 14.6.24 Aluna Frances and George Reid, "You Know You Like It" (2012)

Figure 14.6.25 Janee Bennett, Jessica Glynne, Jack Patterson, and Ina Wroldsen, "Hold My Hand" (2015)

14.6.3 8 Groups of 3 Plus 4 Groups of 2

the 3+3+2 pattern can also be expanded to 8 groups of 3 sixteenth notes followed by 4 groups of 2 sixteenth notes, as shown in the example below.



Listen for this rhythm in the examples below.

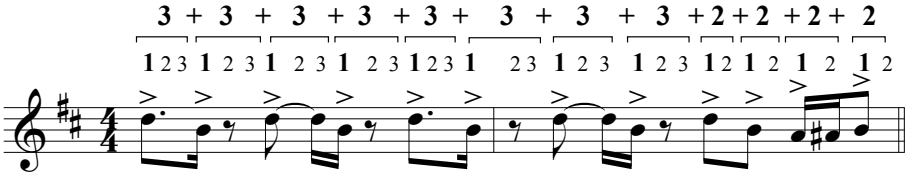


Figure 14.6.26 Ray Parker, Jr., "Ghostbusters" (1984)

Figure 14.6.27 Pink, Max Martin, Johan Schuster, "Raise Your Glass" (2010)

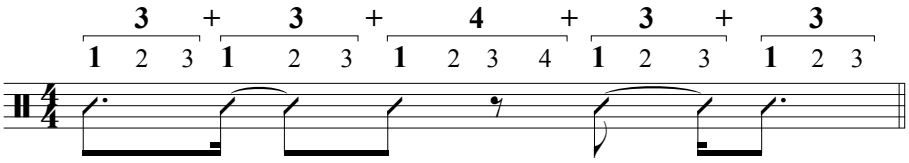
Figure 14.6.28 Too Many Zooz, "Warriors" (2016)

14.6.3.1 Other Combinations of 3s and 2s

You will also find other combinations of 3s and 2s (or 3s and 4s).

Figure 14.6.29 Stefan Gordy, Skyler Gordy, David Listenbee, Peter Schroeder, "Party Rock Anthem" (2011)

Notice that this progression is from the i–VII–VI–VII progression. The rhythm in the above example is dissected below.



Listen for the 3+3+4+3+3 rhythm in the following examples.

Figure 14.6.30 Onika Maraj, Nadir Khayat, Carl Falk, Rami Yacoub, Wayne Hector, and Bilal Hajji, "Starships" (2012)

Figure 14.6.31 Max Martin, Savan Kotecha, Ilya Salmanzadeh, Amethyst Kelly, Ariana Grande, "Problem" (2014)

One also finds the 3+3+4+3+3 pattern in the second bar of "Tik Tok," an example from earlier in the chapter.

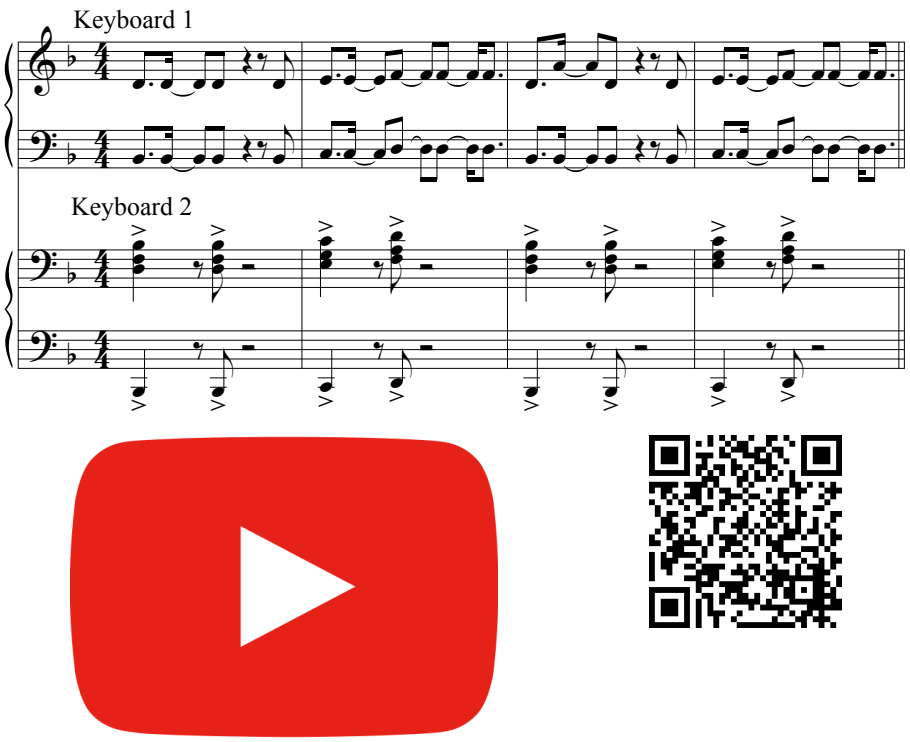


Figure 14.6.32 Kesha Sebert, Lukasz Gottwald, Benny Blanco, "Tik Tok" (2009)

Notice that this progression comes from a rotation of the i–VII–VI–VII progression.

14.7 Distinctive Bass Lines

Sometimes the identity of a song is in its repeated bass line (known as a "riff," which is a short repeated pattern). Listen to the distinctive bass lines in the following examples.

Figure 14.7.1 Joseph Eastburn Winner, "Little Brown Jug" (1869)

Figure 14.7.2 Lennon-McCartney, "Day Tripper" (1965)

Figure 14.7.3 Bernard Edwards and Nile Rodgers, "Good Times" (1979)

Figure 14.7.4 John Deacon, "Another One Bites the Dust" (1980)

Figure 14.7.5 Rick James, "Superfreak" (1981)

Figure 14.7.6 David Bowie, "Under Pressure" (1981)

Figure 14.7.7 Amethyst Kelly, Charlotte Aitchison, George Astasio, Jason Pebworth, Christopher Shave, Kurtis McKenzie, "Fancy" (2014)

Figure 14.7.8 Ben Haggerty, Ryan Lewis, Jacob Dutton, Eric Nally, Joshua Karp, Joshua Rawlings, Darian Asplund, Evan Flory–Barnes, Tim Haggerty, "Downtown" (2015)

14.7.1 Distinctive Guitar Riffs

You will also find distinctive riffs played by guitar in conjunction with bass, as in the following examples.

Figure 14.7.9 Ray Davies, "You Really Got Me" (1964)

Figure 14.7.10 Jimmy Page and Robert Plant, "Immigrant Song" (1970)

Figure 14.7.11 Steven Tyler and Joe Perry, "Walk This Way" (1975)

Figure 14.7.12 Angus Young, Malcolm Young, and Brian Johnson, "Back in Black" (1980)

This chapter is meant to give you ideas about animating chords and chord progressions with accompanimental textures, including riffs. It is by no means meant to be exhaustive, but rather to encourage you to listen closely to texture and accompaniment.

Chapter 15

Creating Contrast Between Sections

In this chapter, we will explore how a composer or arranger can create contrast between different sections in a piece of music.

15.1 The Elements of Music

Creating contrast usually involves varying one or more of the "Elements of Music," which are listed and explained below.

Table 15.1.1 The "Elements of Music"

Melody	We all know what melody is, but don't confuse melody with ostinato! Melody lives and breathes and has variety.
Harmony	In this section, we will associate harmony with key and mode (major versus minor).
Rhythm	What the most common rhythmic value is in a section.
Timbre	The different tone colors of different instruments, and the different tone colors an individual instrument can produce.
Texture	Described in the previous chapter as existing in the vertical plane (the number of voices) and the horizontal plane (rhythmic activity of the various voices).
Articulation	Staccato versus legato, or short, clipped notes versus long, sustained or connected notes.
Dynamics	Loud versus soft.
Register	High versus middle versus low.

In the next two sections we will look at how two different pieces exhibit contrast between various sections using the elements of music.

15.2 Mozart, *Eine kleine Nachtmusik*, K. 525, II.

The second movement of Mozart's *Eine kleine Nachtmusik* is a five-part rondo form (ABACA).

Let us examine the elements of music in the first section (the A section).

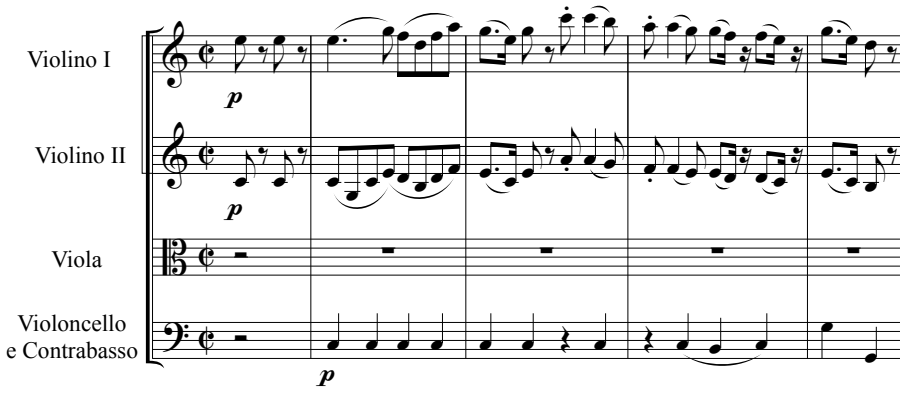


Figure 15.2.1

Notice how Mozart expresses the various musical elements:

Table 15.2.2 A Section, Second Movement, *Eine kleine Nachtmusik*

Harmony	The key is C major
Rhythm	The 8th note is most common rhythmic value, though the phrase begins with quarter-note values
Texture	The top two instruments are grouped together against a simple bass part
Articulation	Generally legato
Dynamics	Soft
Register	Neither extremely high nor low

Here is the beginning of the second section (the B section):

Figure 15.2.3 B Section, Second Movement, *Eine kleine Nachtmusik*

Here are the most noticeable differences:

Table 15.2.4 B Section, Second Movement, *Eine kleine Nachtmusik*

Rhythm	8th notes are the most common rhythmic value, with some 16th-note runs
Texture	All four voices move in the same rhythm at the beginning of each subphrase
Articulation	Four staccato notes start each subphrase

Now, look at the beginning of the next contrasting section (the C section):

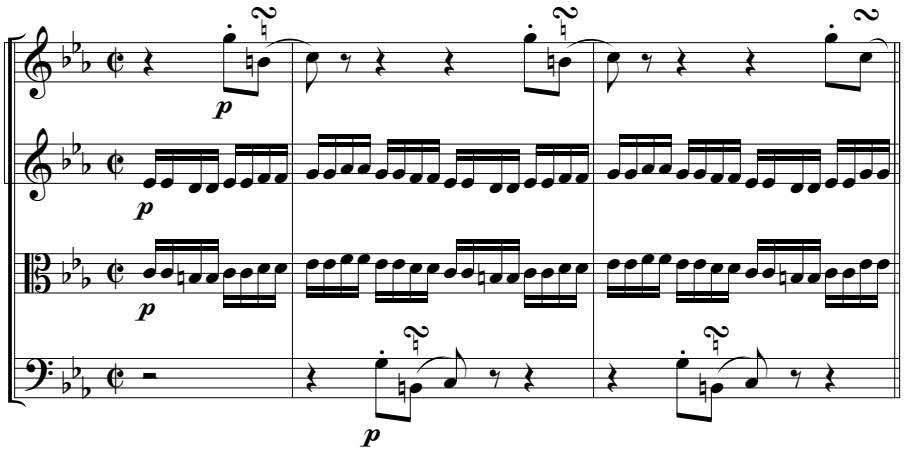


Figure 15.2.5 C Section, Second Movement, *Eine kleine Nachtmusik*

The following elements are noticeably changed:

Table 15.2.6 C Section, Second Movement, *Eine kleine Nachtmusik*

Harmony	This section begins in C minor
Rhythm	The accompaniment moves in 16th notes and the ornamentation of the second melody note (the turn) in the outer parts sounds as four 32nd notes
Texture	The middle two parts (Violin II and Viola) are paired together and the Violin I and Cello/Bass part engage in imitation
Articulation	The middle parts are played in a "separated" manner (more staccato than legato) and the motive in the outer voices starts with a staccato note

Listen to how Mozart puts the entire form together, including transitional material to smooth out the changes from one section to another.

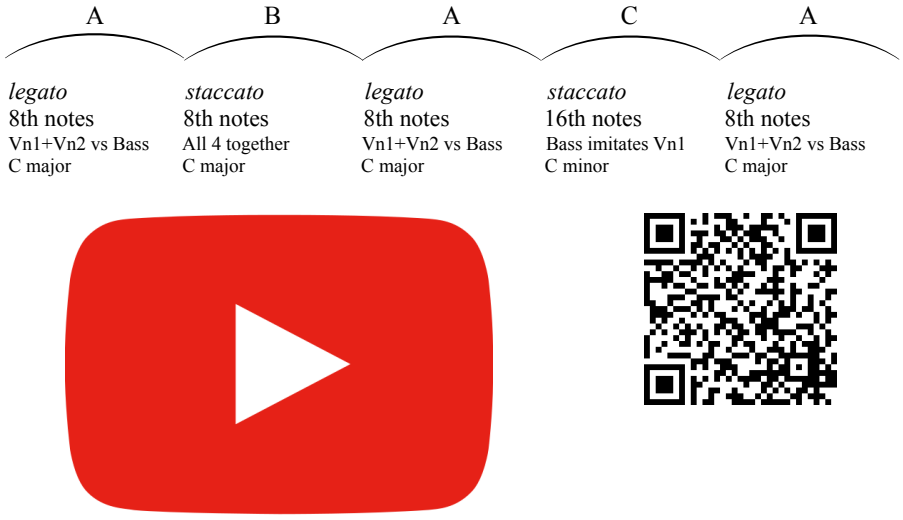
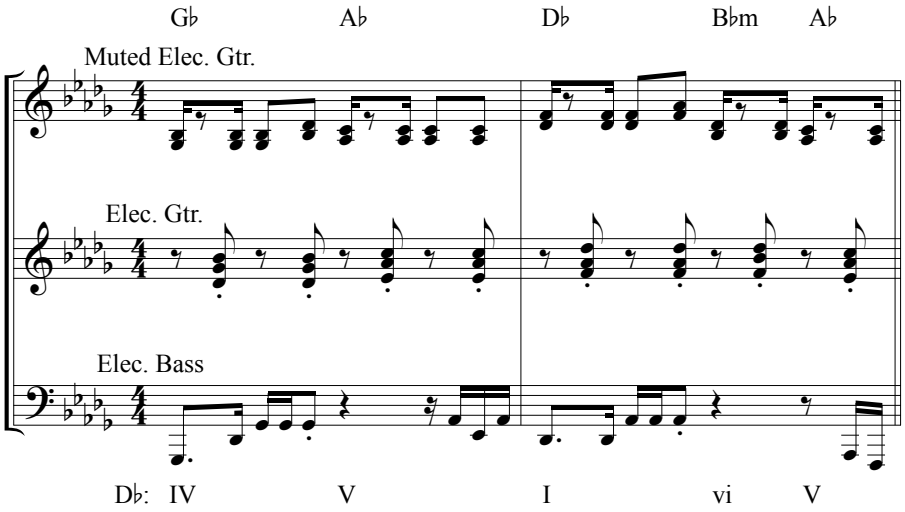


Figure 15.2.7 Formal Diagram of Second Movement, *Eine kleine Nachtmusik*

15.3 "Rude" by MAGIC!

Now we will examine contrast in recent popular music. Here is the musical example of the texture from the reggae section of this song, as seen in the previous chapter.



In Verse 1 there is no bass drum, snare drum, or electric bass. All we hear are the voice part and the two guitar parts from the top two staves in the example above. There are fewer voices occurring on the vertical plane, creating a light texture.

Figure 15.3.1 Verse 1 of "Rude"

The bass guitar and drum groove enter in Verse 2, thickening the texture and adding the backbeat of the snare drum.

Figure 15.3.2 Verse 2 of "Rude"

In the pre-chorus, the guitars and bass have legato half notes and quarter notes while the drummer plays cross-stick eighth notes (if one is counting in a slow $\frac{4}{4}$). Without the snare drum backbeat, the texture lightens.

Figure 15.3.3 Pre-Chorus of "Rude"

The chorus has approximately the same accompaniment as Verse 2 but the voice parts are in a higher register, repeating a 2-measure subphrase containing the "hook."

Figure 15.3.4 Chorus of "Rude"

The post-chorus emphasizes a (3+3+2)+(3+3+2) rhythm on all instruments (guitars, bass, and the bass drum, snare drum, and hi-hat of the drum set).

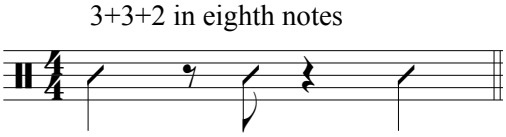


Figure 15.3.5 Post-Chorus of "Rude"

Below is a formal diagram of the first five sections of "Rude."

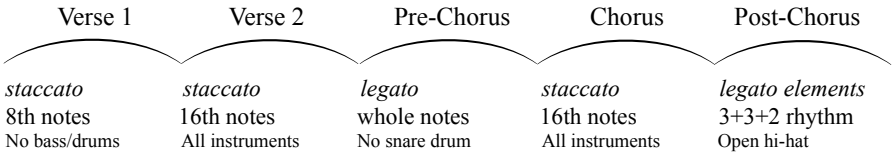
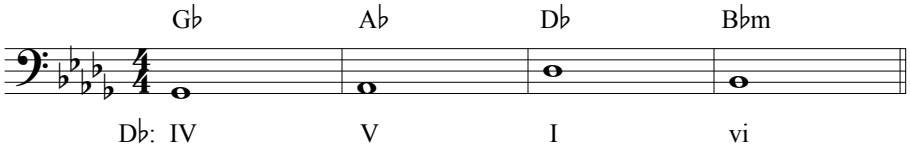


Figure 15.3.6 First 5 Sections of "Rude"

This five-section unit repeats again with Verse 3, Verse 4, the Pre-Chorus, Chorus, and Post-Chorus.

When you listen to the entire piece, you hear how the musicians designate the form using the elements of articulation, rhythm, texture, and dynamics.

One element that changes very little during entire song is the chord progression, which we examined in the chapter on harmonic progression, and is a rotation of the 50s progression.



While you are likely aware of successful songs in the which very few musical elements change, it is worth considering how you can articulate the form of your compositions and arrangements using the elements of music.

Chapter 16

Figured Bass

16.1 Historical Context

In the Baroque era in music (roughly 1600–1750 C.E.), a shorthand was developed for writing chords. (Lead-sheet symbols are the modern shorthand for representing chords). **Figured bass** (also known as **thoroughbass**) consists of a bass line notated on a staff accompanied by numbers representing intervals to be played above the bass note within the key signature. (These figured-bass numbers are traditionally notated below the bass line.)

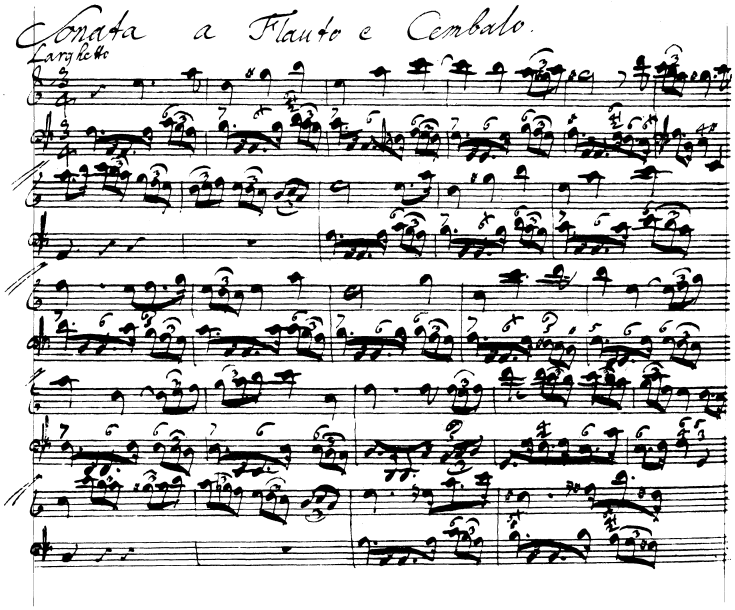


Figure 16.1.1 George Frideric Handel's handwritten manuscript of Recorder Sonata in A minor, HWV 362, I. Larghetto

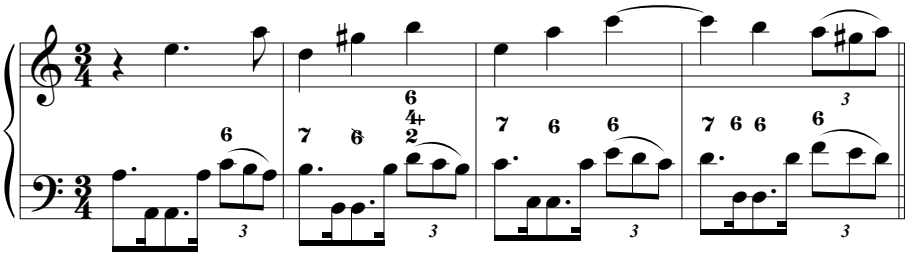


Figure 16.1.2 George Frideric Handel, Recorder Sonata in A minor, HWV 362, I. Larghetto, without figured bass realization

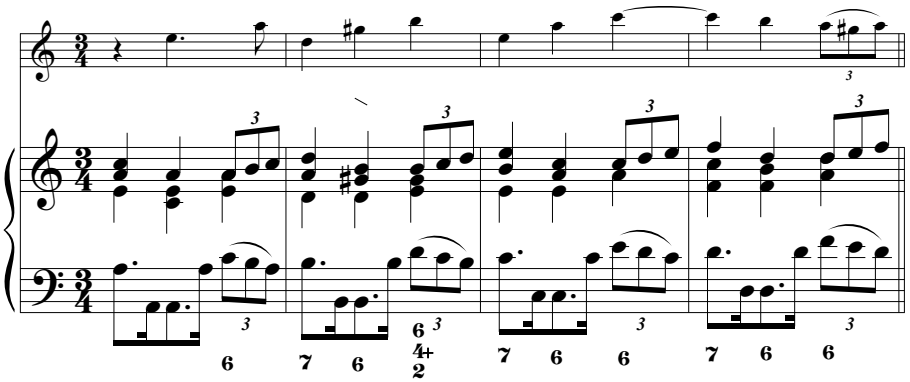


Figure 16.1.3 George Frideric Handel, Recorder Sonata in A minor, HWV 362, I. Larghetto, with figured bass realization

Like lead-sheet symbols, figured bass allowed a keyboardist or guitarist freedom in choosing chord voicings. While some early music specialists perform from scores with the original notation, editions of Baroque compositions by composers like J.S. Bach and Handel that were originally notated with figured bass have been "realized" or written out in modern editions.

In the present day, figured bass is taught in music theory courses primarily as a shorthand for chord inversion symbols (although many music programs also endeavor to teach students to perform at the piano music written with figured bass notation).

16.2 Figured Bass Inversion Symbols

Following are the figured bass inversion symbols most commonly used for triads and seventh chords. (Remember that figured bass numbers represent intervals above the bass note within the key signature.)

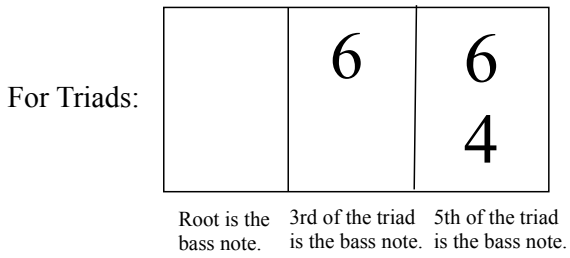


Figure 16.2.1 Figured Bass Inversion Symbols for Triads

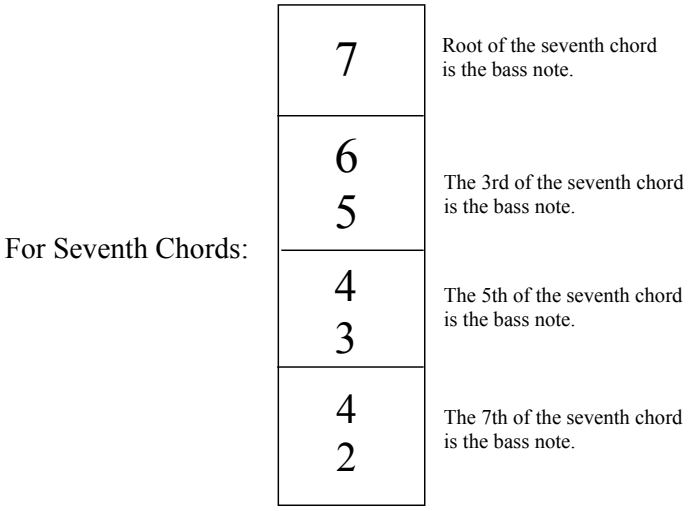


Figure 16.2.2 Figured Bass Inversion Symbols for Seventh Chords

Unlike original figured bass notation in the Baroque era, in music theory courses, figured bass inversion symbols are placed after Roman numerals.

Compare figured bass symbols to the modified slash notation we have been using in previous chapters.

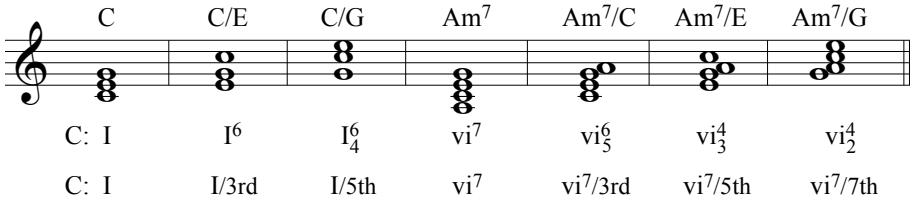


Figure 16.2.3 Roman Numerals with Figured Bass versus Roman Numerals with Modifed Slash Notation

Because the figures $\frac{6}{5}$, $\frac{4}{3}$, and $\frac{4}{2}$ are only used for seventh chords, the "7" is omitted when labeling inverted seventh chords.

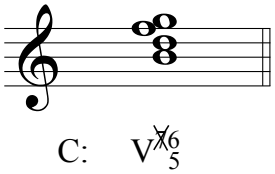


Figure 16.2.4 "7" is not included when 7th chords are inverted

Notice that it is essential with seventh chords to include symbols like "M"

(for a major seventh chord) and ° and ø *before* the figured bass numbers and *after* the Roman numeral.

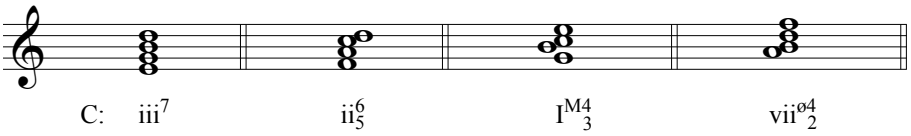


Figure 16.2.5

16.3 The Cadential Six-Four Chord

A common term in music theory—the "**cadential six-four**" (or cadential $\binom{6}{4}$)—is used to refer to the I^6_4 that regularly proceeds the V chord in cadences.

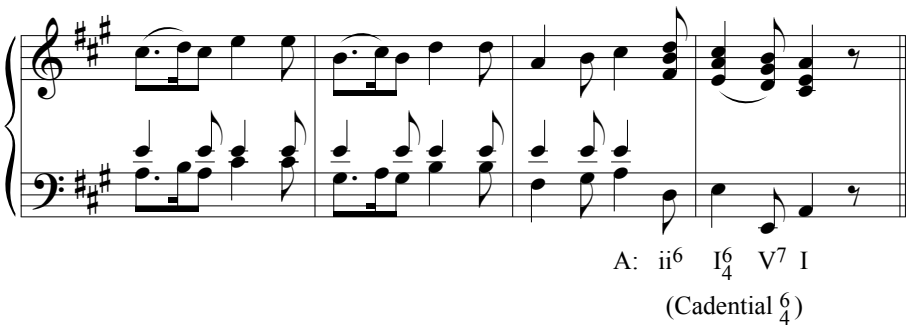


Figure 16.3.1 Mozart, Piano Sonata K. 331, I

Figure 16.3.2 Francis Scott Key and John Stafford Smith, "The Star-Spangled Banner"

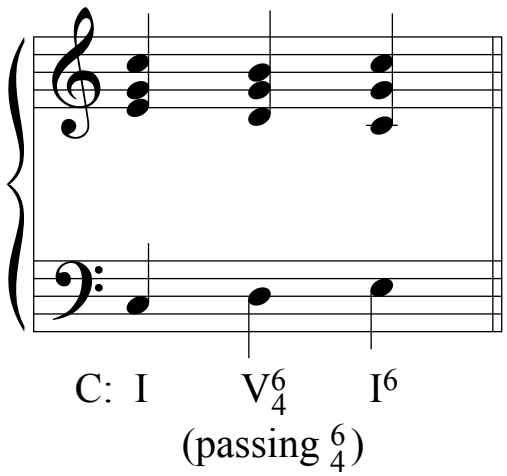
It is worth remembering that the cadential $\frac{6}{4}$ (or I^6_4) has dominant function, just like the V chord that usually follows it. Previously, we have called this chord "I/5th."

We will use the term "cadential six-four" throughout the rest of this text, now that figured bass has been introduced.

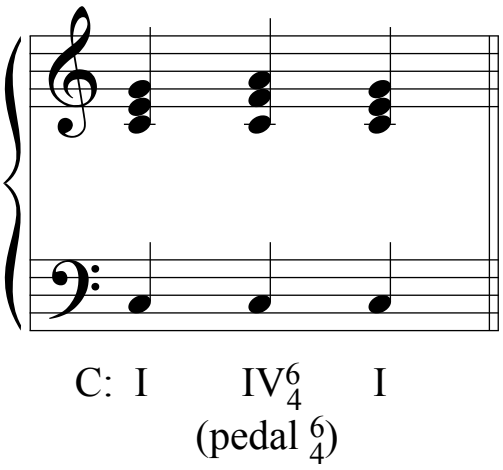
16.4 Other Occurrences of Six-Four Chords

Second-inversion chords with the fifth of the chord in the bass, also known as $\frac{6}{4}$ chords, are special chords found only in four situations in classical music.

1. Cadential six-four (discussed in the previous section)
2. Passing six-four: the bass line will look like a passing-tone figure, with three stepwise ascending or descending notes, and the middle chord will be a $\frac{6}{4}$ chord



3. Pedal six-four: the bassline will consist of three repeated notes, and the middle chord will be a $^6_4$ chord.



4. Melodic bass six-four: in this situation, the bass voice has the melody; when the fifth of the chord occurs in this bass voice melody, the result will be a $^6_4$ chord.

16.5 Additional Information

Although we will not use them in our harmonic analyses, you will sometimes encounter figured bass symbols containing all of the intervals above the bass note in Baroque music containing figured bass. The common figured bass inversion symbols in the previous sections are abbreviations of the figures given in the examples below.

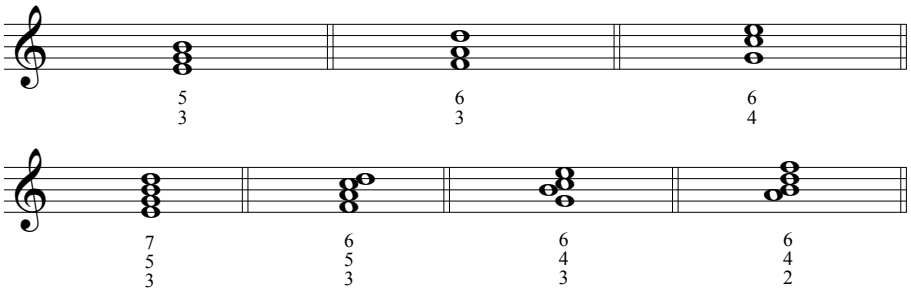


Figure 16.5.1 "Full" Figured Bass symbols showing *every* interval above the lowest note

Additionally, you may notice that figured bass numbers in actual music (but not in Roman numeral labeling) *may be altered chromatically* with the following symbols.

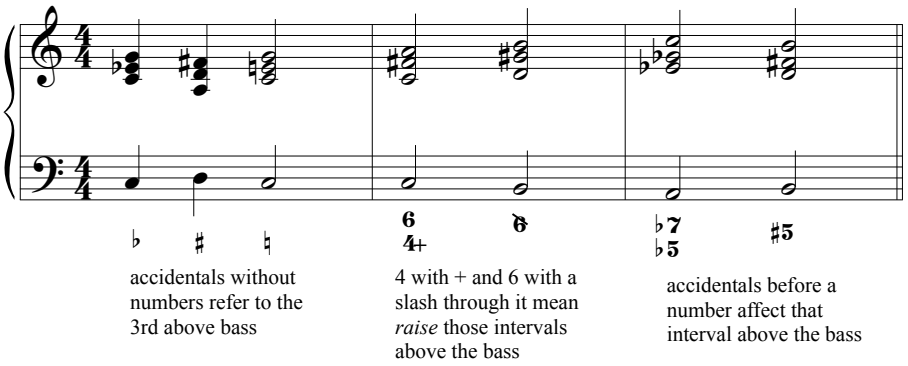
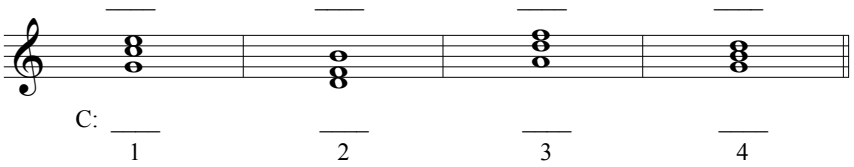


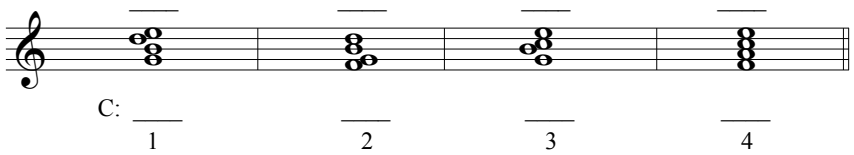
Figure 16.5.2 Figured Bass with Chromatic Alterations

16.6 Practice Exercises

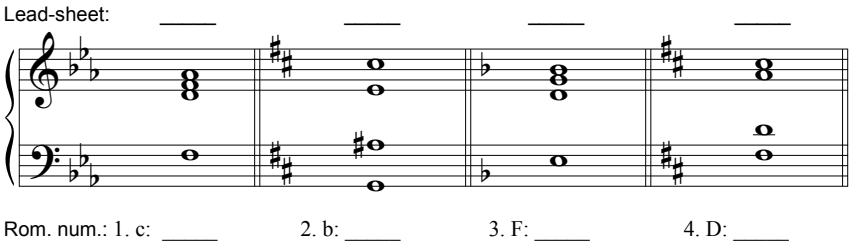
1. Analyze the triads with lead-sheet symbols above and Roman numerals with figured bass inversion symbols below the staff.



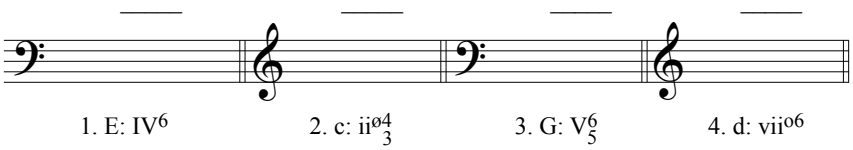
2. Analyze the seventh chords with lead-sheet symbols above and Roman numerals with figured bass inversion symbols below the staff.



3. Label the given chords using lead-sheet symbols above and Roman numerals with figured bass inversion symbols below.



4. Write the specified chords. Analyze the chords with lead-sheet symbols. Include key signatures.



5. Analyze the excerpt using Roman numerals with figured bass inversion symbols below and lead-sheet symbols above. Analyze non-chord tones.

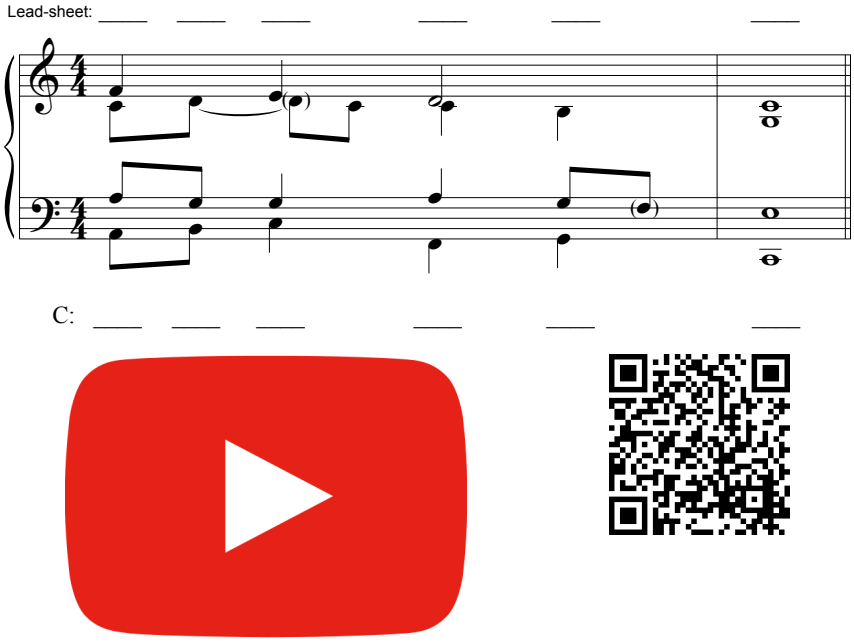


Figure 16.6.1 J.S. Bach, Chorale 175, "Jesus, meine Zuversicht"

Click here to download the homework assignment for this chapter.

PDF versions of the textbook, homework exercises, and practice exercises can be found at musictheory.pugetsound.edu

Chapter 17

Secondary Dominant Chords

So far we have studied diatonic harmony (chords without accidentals, with the exception of the use of raised $\hat{6}$ and $\hat{7}$ in minor, which are considered diatonic). In the following chapters, we will study *chromatic* harmony.

17.1 Examples with Secondary Dominants

Secondary dominants are common in classical and popular music. Here are examples with the chromatic chords noted. We will examine these chords more closely later in the chapter.

Figure 17.1.1 Paul McCartney, "Yesterday" (1965)

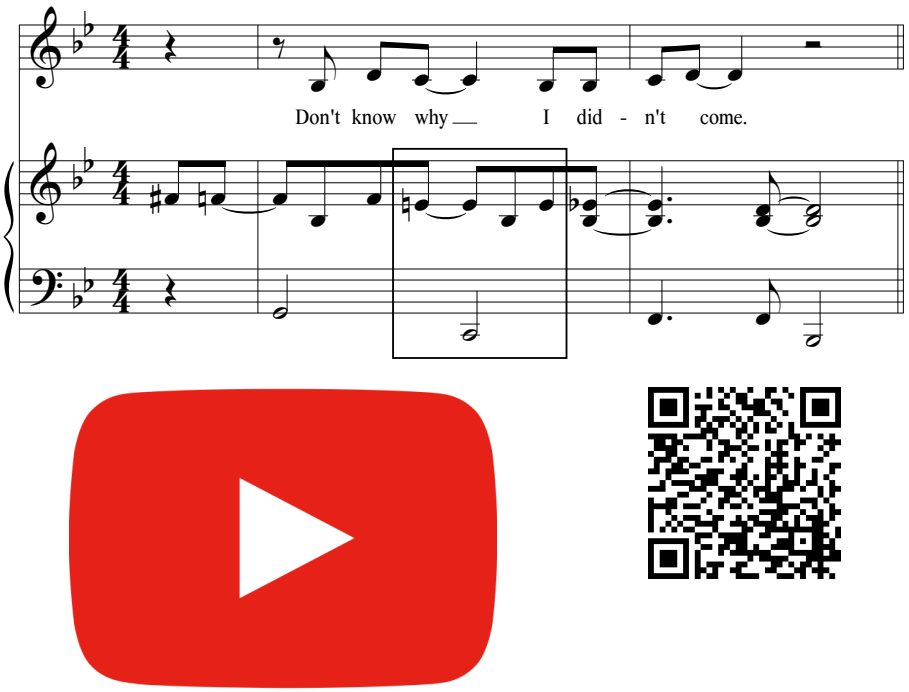


Figure 17.1.2 Jesse Harris, "Don't Know Why" (2002)

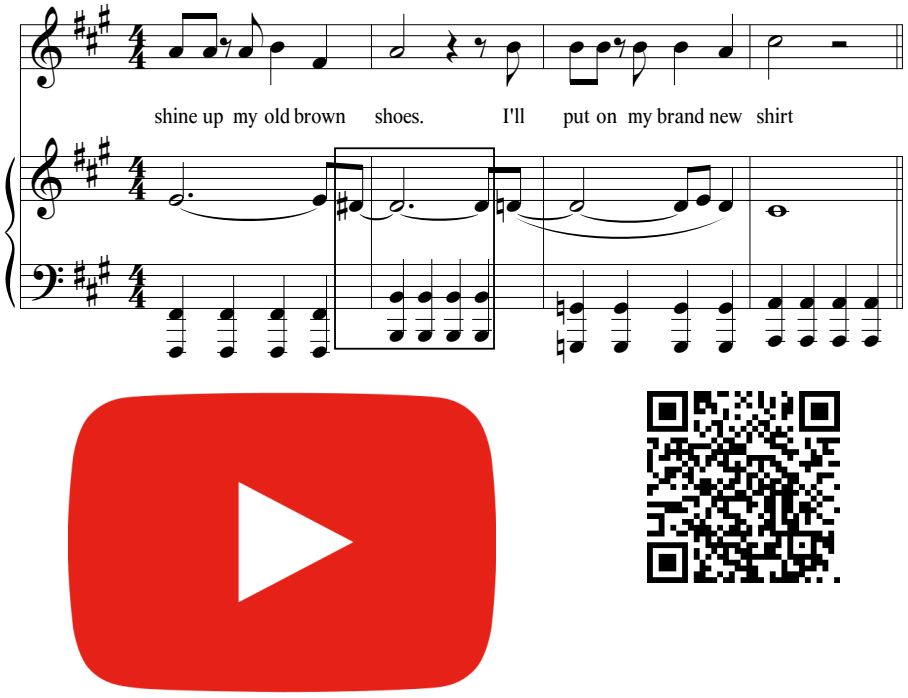


Figure 17.1.3 Rick Nielson, "I Want You to Want Me" (1977)

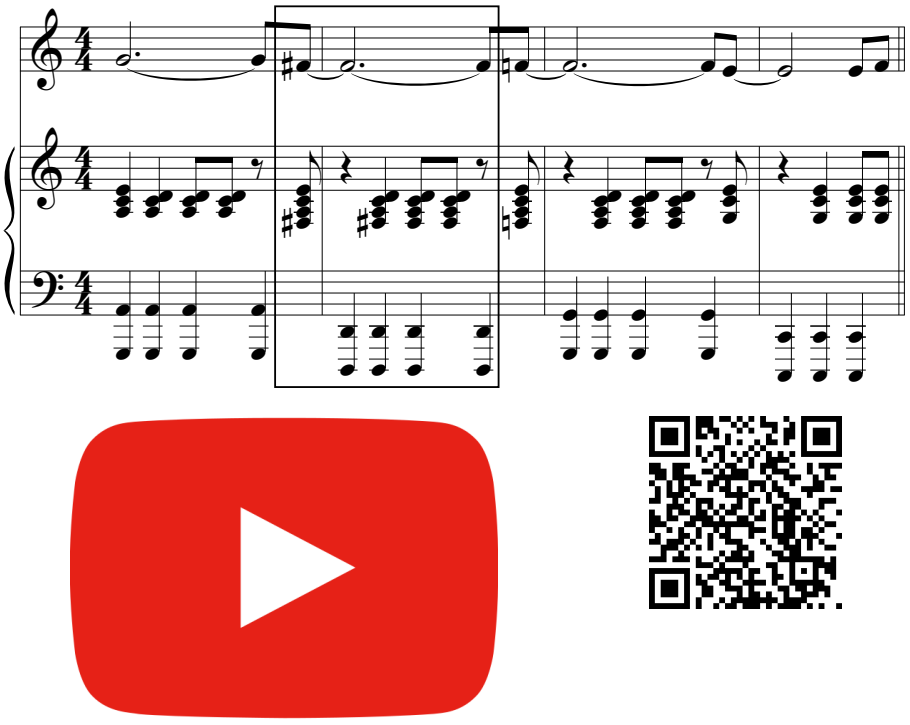


Figure 17.1.4 Robert William Lamm, "Saturday in the Park" (1972)

Figure 17.1.5 Bruno Mars, CeeLo Green, Philip Lawrence, and Ari Levine, "Forget You" (2010)

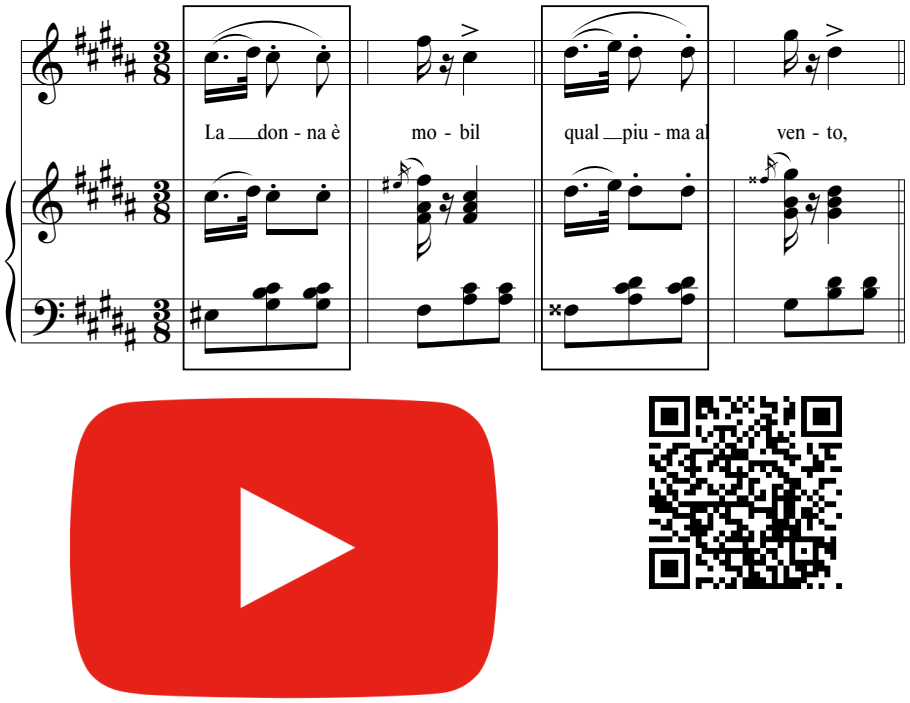


Figure 17.1.6 Verdi, *Rigoletto*, "La donna è mobile" (1851)

Figure 17.1.7 Tchaikovsky, *The Nutcracker*, "Miniature Overture" (1892)

17.2 Tonicization

In this chapter and the next, we will study **tonicization**, which means treating a chord *other* than the I chord like a tonic by approaching it with its dominant. In diatonic harmony, the V chord (the dominant) resolves to the I chord (the tonic). A *secondary* dominant is a major triad or dominant seventh chord that resolves to (or *tonicizes*) a chord other than the I chord.

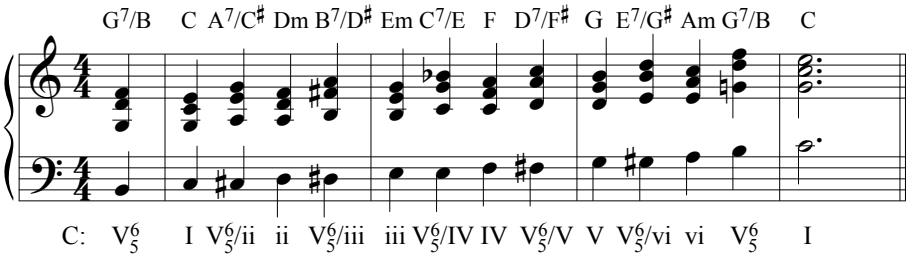


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Figure 17.2.1

Sing the bass line of the example above and notice that a secondary chord, through its chromaticism, intensifies the drive to the next chord.

Principle 17.2.2 Secondary Dominants. *The Roman numeral after the slash is the chord being tonicized by the V chord before the slash.*

You may find that you want to analyze the $D^7/F^\sharp$ in the example above as a II^6_5 instead of a V^6_5/V (which we pronounce as "V^6_5 *of* V"), and the $E^7/G^\sharp$ as a III^6_5 instead of V^6_5/vi ("V^6_5 *of* vi"). Notice, however, that a ii chord is typically minor in a major key and diminished in a minor key (ii°), making uppercase II a chromatic harmony for which the proper label is V/V.

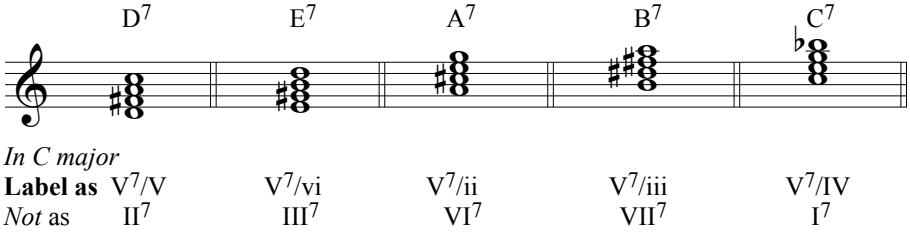

Figure 17.2.3

While labeling D^7 as II^7 in C major makes the root clear, it does not communicate the function of the D^7, which is to progress to a G major chord (the V chord, or the dominant in C major).

Also, notice that vii° is not tonicized with its secondary dominant in the example above. Listen to the following example to understand why diminished chords such as vii° and ii° in minor are not tonicized.

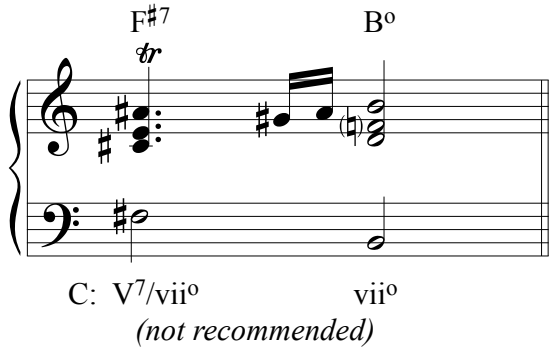

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Figure 17.2.4

17.3 Secondary Dominants in Major and Minor

Both major triads and major–minor seventh chords can be secondary dominant chords.

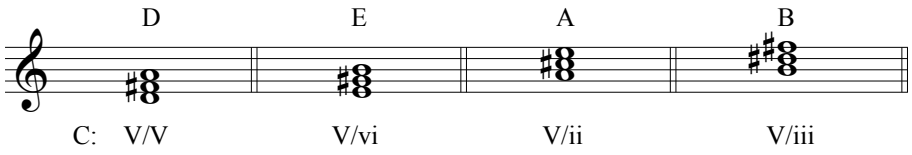


Figure 17.3.1 Secondary Dominant Triads in Major

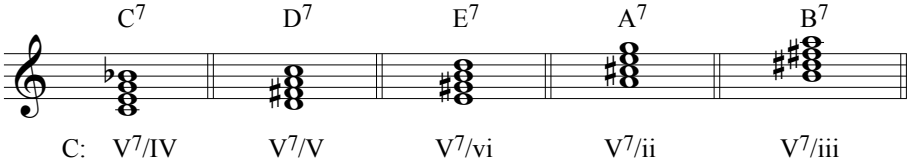


Figure 17.3.2 Secondary Dominant Seventh Chords in Major

Notice the chromaticisms in the example above. The raised notes generally act as the leading–tone to the root of the chord being tonicized. In the major mode, the only secondary dominant with a lowered chromaticism is V^7/IV. The lowered note in V^7/IV acts as $\hat{4}$ of the chord being tonicized in the same way the last flat of a key signature is $\hat{4}$.

Below are all secondary dominant chords (triads and major-minor seventh chords) in the minor mode.

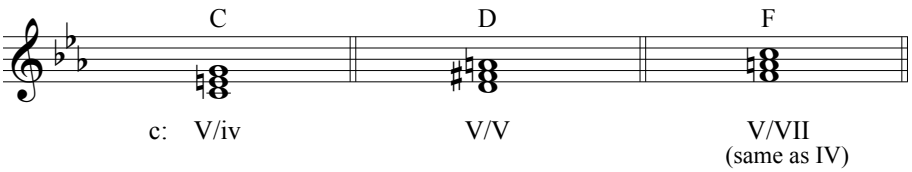


Figure 17.3.3 Secondary Dominant Triads in Minor

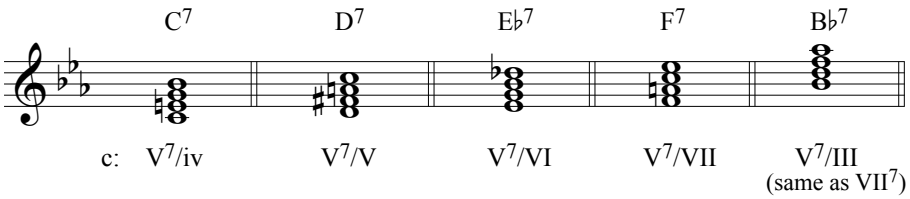


Figure 17.3.4 Secondary Dominant Seventh Chords in Minor

Remember that both vii° (on raised $\hat{7}$) and the subtonic VII (on the lowered $\hat{7}$) (see Definition 7.3.2) occur in the minor mode. The subtonic VII can be tonicized with V^7/VII, while vii°, being diminished, cannot.

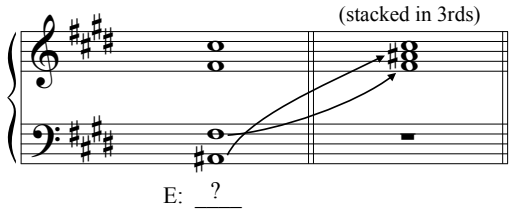
Notice that an F major chord in C minor can be V/VII or IV, depending on how it functions or progresses. If the F major chord progresses to a B♭ chord, label the F chord as V/VII. If the F major chord has pre–dominant function and progresses to a G major chord (in any inversion) or B°, label the F chord as IV.

The $B^{\flat 7}$ chord, on the other hand, can be labeled correctly as V^7/III or VII^7 because both V^7/III or VII^7 progress to III in minor.

17.4 Analyzing Secondary Dominants

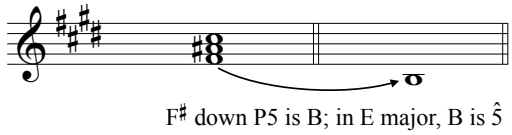
When you encounter a chord with a chromaticism and suspect it is a secondary dominant, use the following process.

1. Stack the chord in thirds to determine the root and quality. If the chord quality is major (if a triad) or a major–minor seventh chord, go on to step 2. If the chord quality is not major or major–minor seventh, the chord is not a secondary dominant.



The chord in question is an F♯ major triad in first inversion.

2. Determine the note that would be a perfect 5th below the *root* of the chord you are analyzing. If this note would be the root of a diatonic chord, the chord you are analyzing is a secondary dominant.

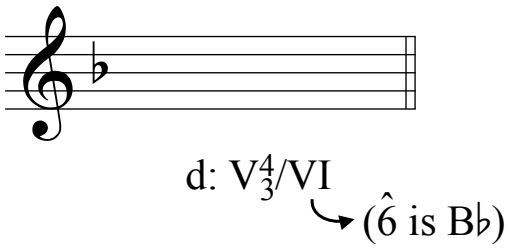


Since B is $\hat{5}$, the F♯ major chord in first inversion is tonicizing V. Therefore the chord is V^6/V.

17.5 Writing Secondary Dominants

To write a secondary dominant, use the following procedure.

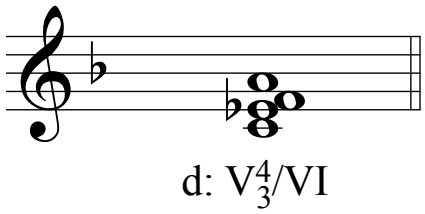
1. First determine the note that is the root of the chord being tonicized (the chord to the right of the slash).



2. Determine the root of the V^7 in the key of B♭ (the Roman numeral *after* the slash): *F*

3. Build a major–minor seventh chord on F: *F–A–C–E♭*

4. Invert the chord accordingly. $\frac{4}{3}$ inversion means the fifth of the chord is in the bass.



17.6 Irregular Resolutions of Secondary Chords

The roots of secondary dominants do not always resolve down a perfect fifth to the tonicized chord. In many of the examples of popular music with secondary dominants at the beginning of this chapter, the secondary dominants resolve deceptively.

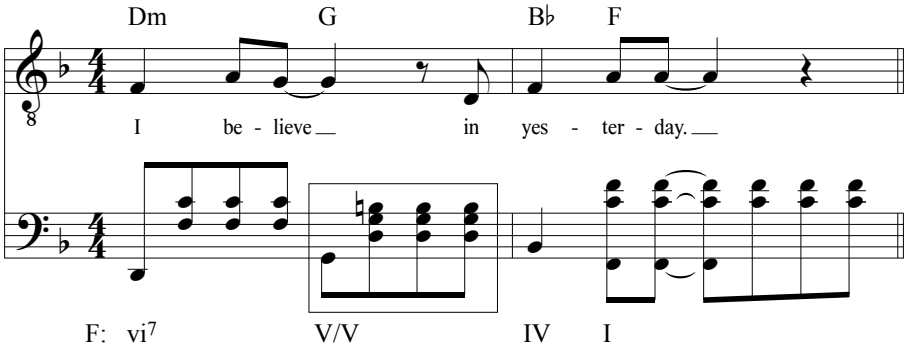


Figure 17.6.1 Paul McCartney, "Yesterday" (1965)

In "Yesterday," the V/V resolves not to V but to IV, which sometimes acts as a substitute for the V chord (the dominant) in popular music.

This progression also happens in "Forget You," where a V^7/V resolves to a IV chord.

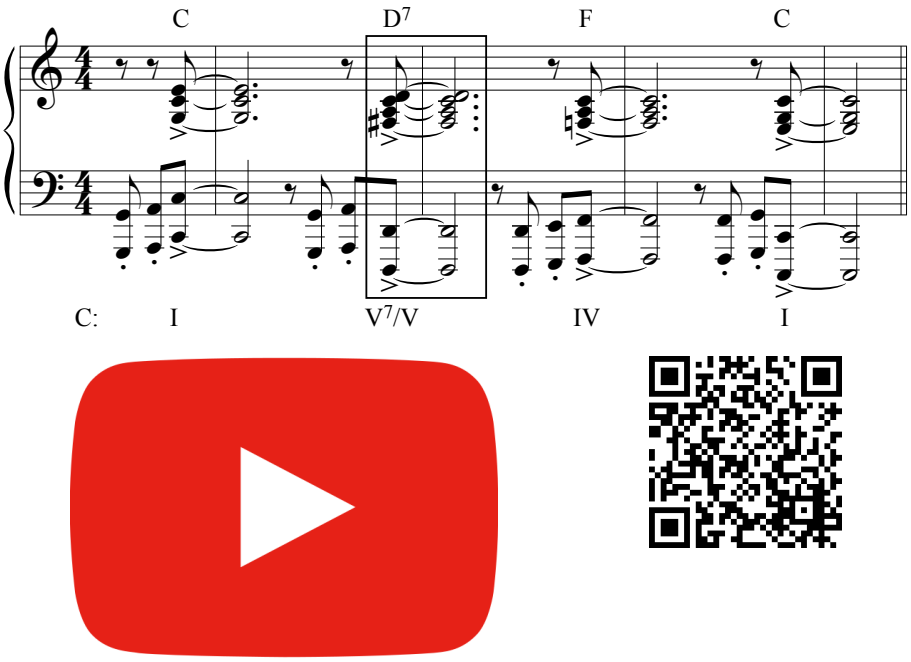


Figure 17.6.2 Bruno Mars, CeeLo Green, Philip Lawrence, and Ari Levine, "Forget You" (2010)

In "I Want You to Want Me" by Cheap Trick, the V/V chord resolves to a subtonic ♭VII chord in A major.

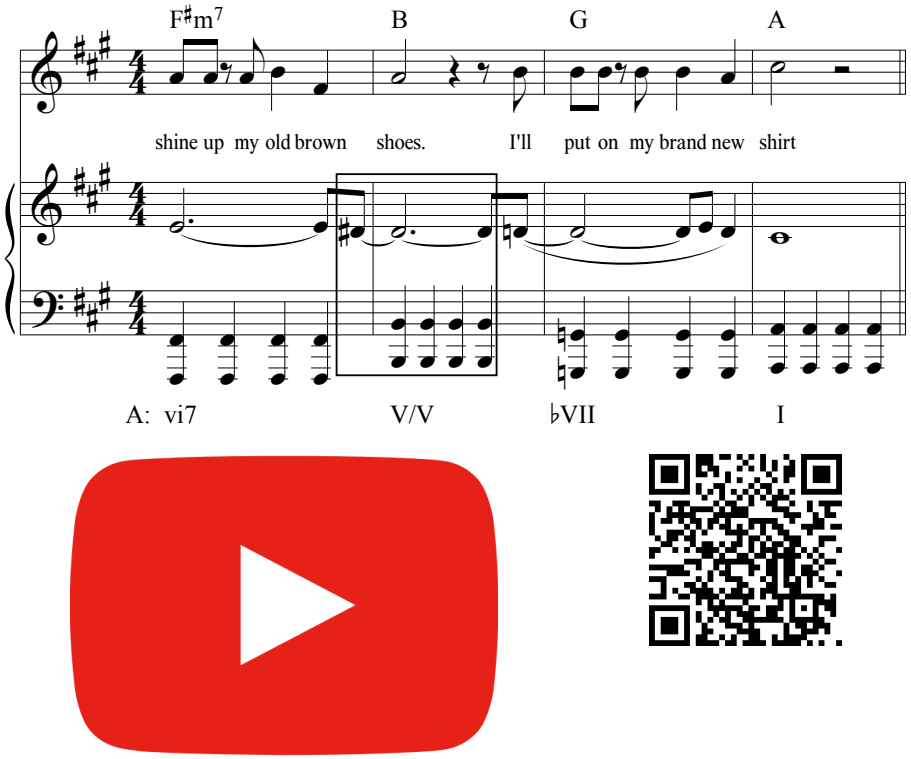


Figure 17.6.3 Rick Nielson, "I Want You to Want Me" (1977)

Remember, however, that the subtonic ♭VII in major can act as a substitute for the dominant (see the Harmonic Flowchart for Popular Music with Subtonic

VII chord in Major).

In "Baby Love" by the Supremes, a $C^7/B^\flat$ in C major (V_2^4/IV) resolves to an A^7 chord (V^7/ii), which then resolves to ii (Dm). In this example, notice that the B♭ in the $C^7/B^\flat$ is a lowered chromatic note that wants to resolve downward by half step to A. Instead of this A being the third of the IV chord (an F major chord), which is the traditional and expected resolution, it is the root of an A^7 chord (V^7/ii).

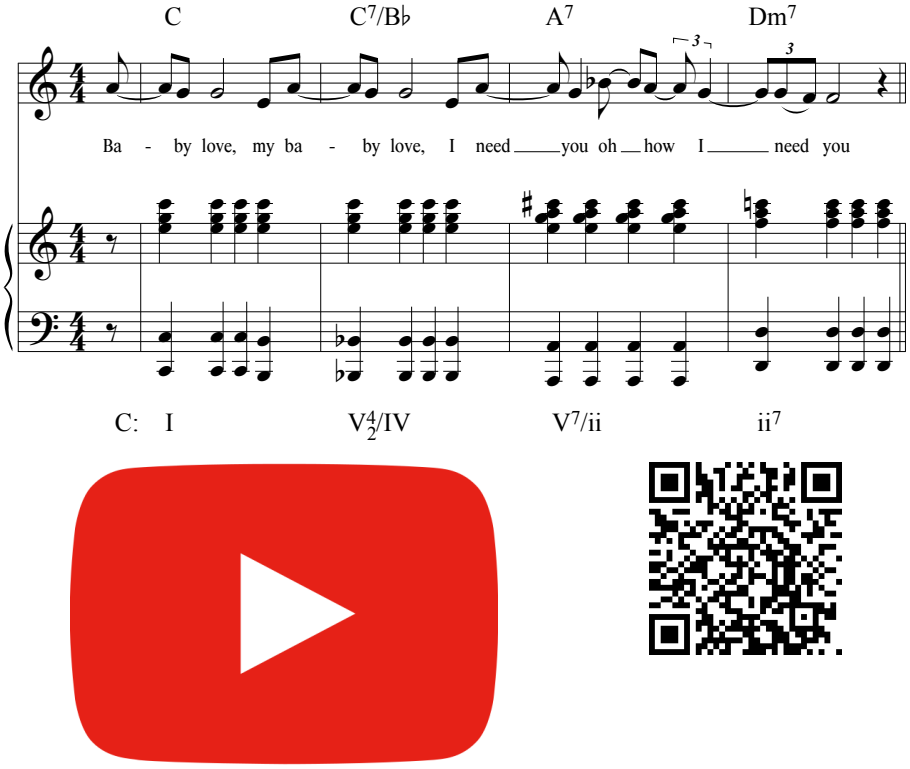


Figure 17.6.4 Lamont Dozier, Brian Holland, and Eddie Holland, "Baby Love" (1964)

Finally, a rather common deceptive resolution of a secondary dominant is V^7/vi to IV, which can be seen in the following three examples.

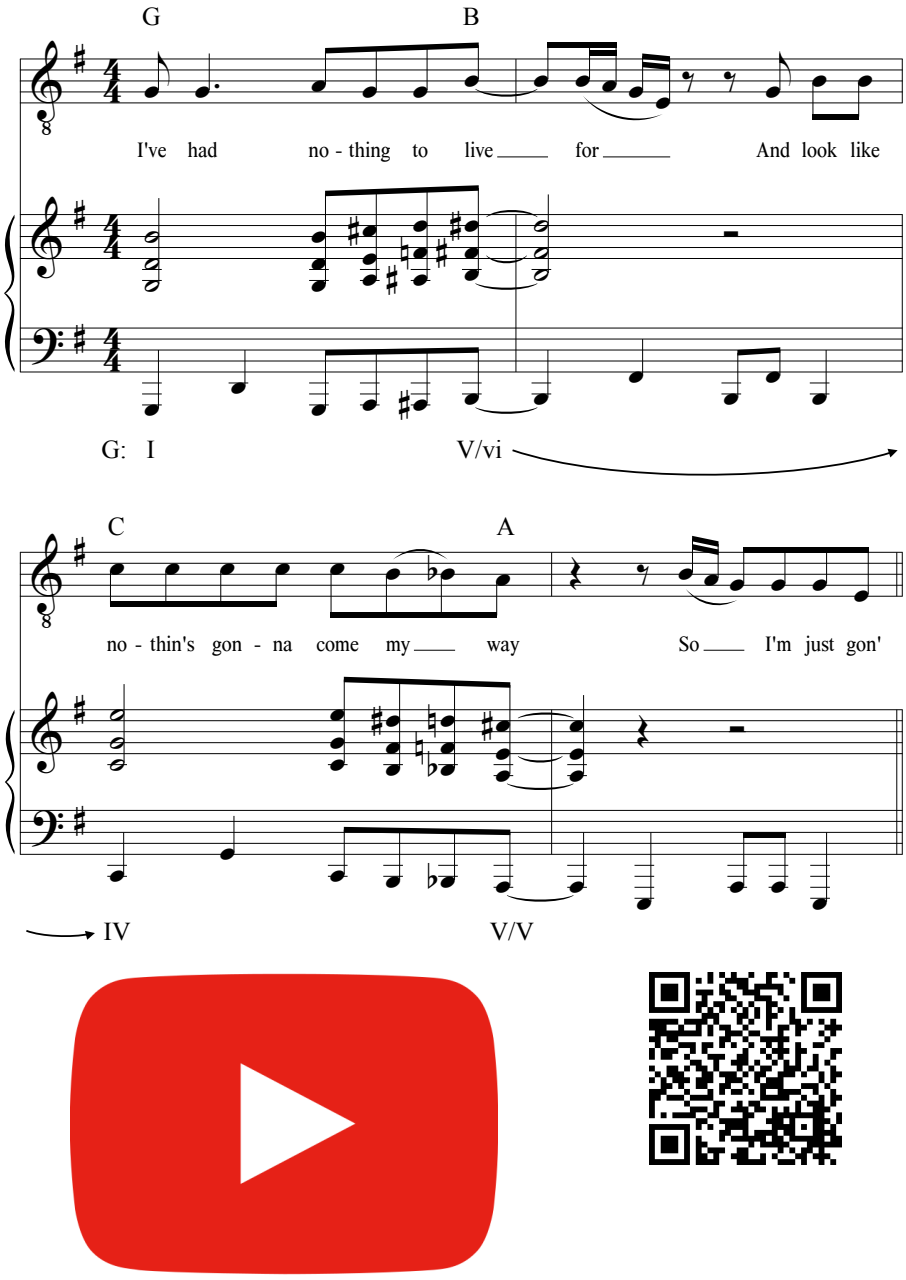


Figure 17.6.5 Steve Cropper and Otis Redding, "(Sittin' On) The Dock of the Bay" (1967)

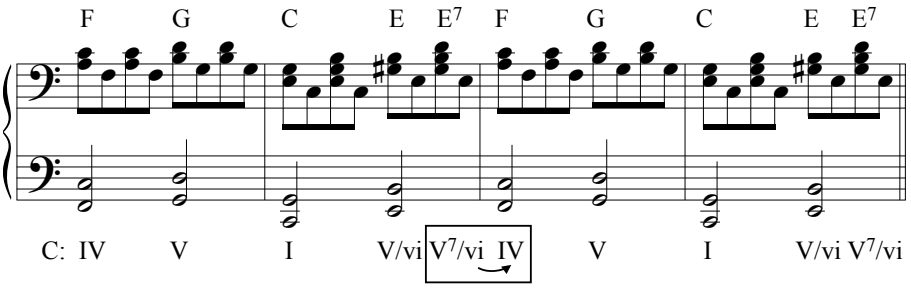


Figure 17.6.6 John Lennon, "Imagine" (1971)

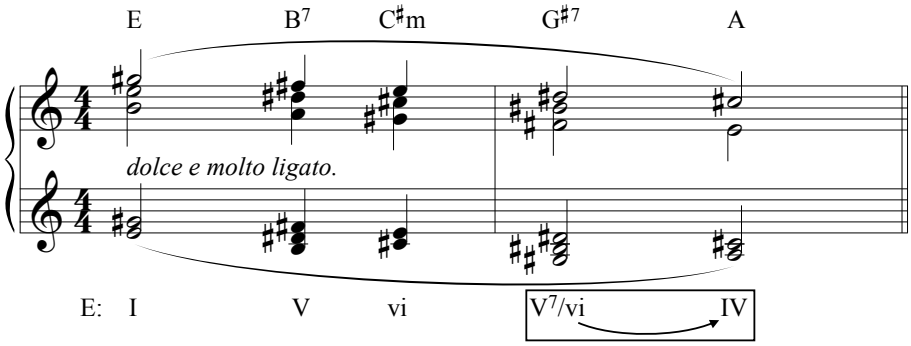


Figure 17.6.7 Beethoven, Piano Sonata Op. 53, I (1804)

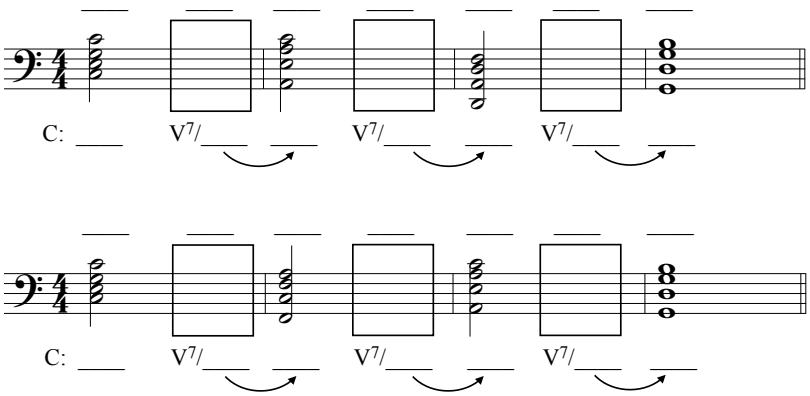
There are two ways to conceptualize this progression. The first is that the progression of iii to IV (Em to F in C major) is not unusual, so E to F, which appears to be III to IV but is in fact V/vi to IV, is a chromatic modification of iii to IV. The other way to think of V/vi to IV is as V/vi to VI/vi, a deceptive progression within the submediant area.

We can conclude that secondary chords do not always resolve strictly to the chords they appear to be tonicizing.

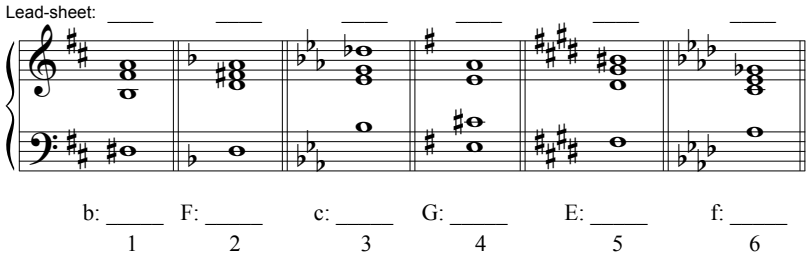
17.7 Practice Exercises

Exercise Group. Day One:

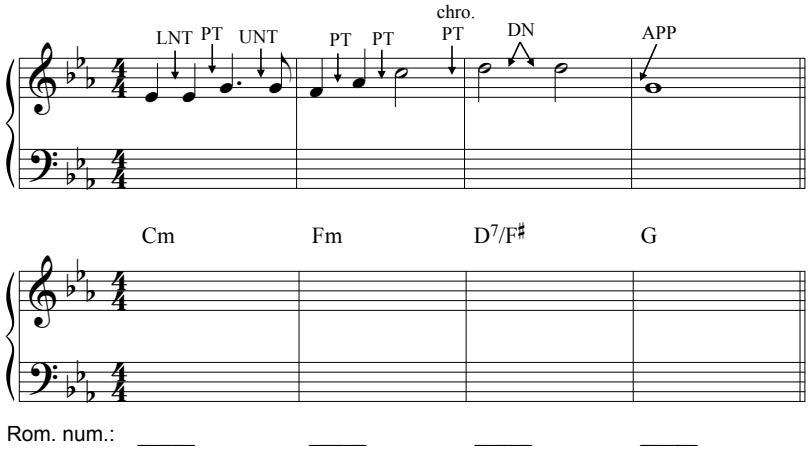
1. Approach each chord with its secondary dominant seventh chord (whose root lies a perfect 5th above the root of the chord of resolution). Label chords with Roman numerals below and lead–sheet symbols above.



2. Analyze the following secondary dominants. Include lead-sheet symbols above.



3. On the empty staff below, copy the notes from the upper staff to the lower staff while adding the specified non–chord tones. (Note: LNT = lower neighbor tone; UNT = upper neighbor tone.) Realize the lead–sheet symbols using quarter–note accompanimental texture. Below the lower staff, analyze the chords using Roman numerals with figured bass inversion symbols.

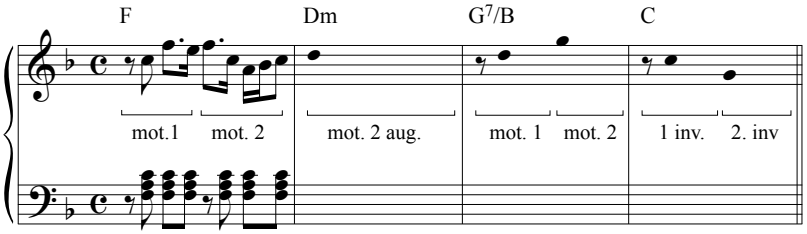


Exercise Group. Day Two:

4. Write the following secondary dominants. Include lead-sheet symbols above. Include key signatures.

1. E♭: V/ii 2. g: V^7/VI 3. e: V^4_2/iv 4. A: V^6/ii

5. For the following example, alter the given motives as specified. Add an accompanimental texture of afterbeats. Analyze the Roman numerals with figured bass inversion symbols below the staff.



F: ____ ____ ____ ____

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Chapter 18

Secondary Diminished Chords

18.1 Secondary Diminished Chords

The vii° chord has dominant function (see the Harmonic Function Flowchart). Since chords of dominant function typically resolve to chords of tonic function, diminished triads as well as half–diminished and fully–diminished seventh chords occur as secondary diminished chords.

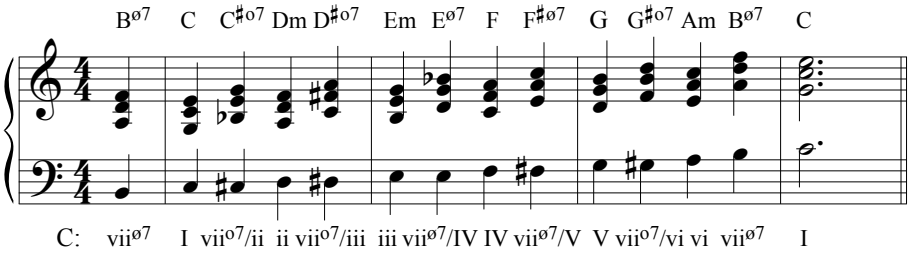

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Figure 18.1.1 A Harmonic Sequence with Secondary Diminished Chords in C major

Below are some examples of pieces with secondary diminished chords. Notice that chromaticism is an "essential" part of secondary diminished chords ("non–essential" chromaticism refers to chromatic non–chord tones).

Figure 18.1.2 J.S. Bach, *Herz und Mund und Tat und Leben* BWV 147, X. "Jesus bleibet Freude" ("Jesu, Joy of Man's Desiring") (1723)

Figure 18.1.3 Tchaikovsky, *The Nutcracker*, "Trepak" (1892)

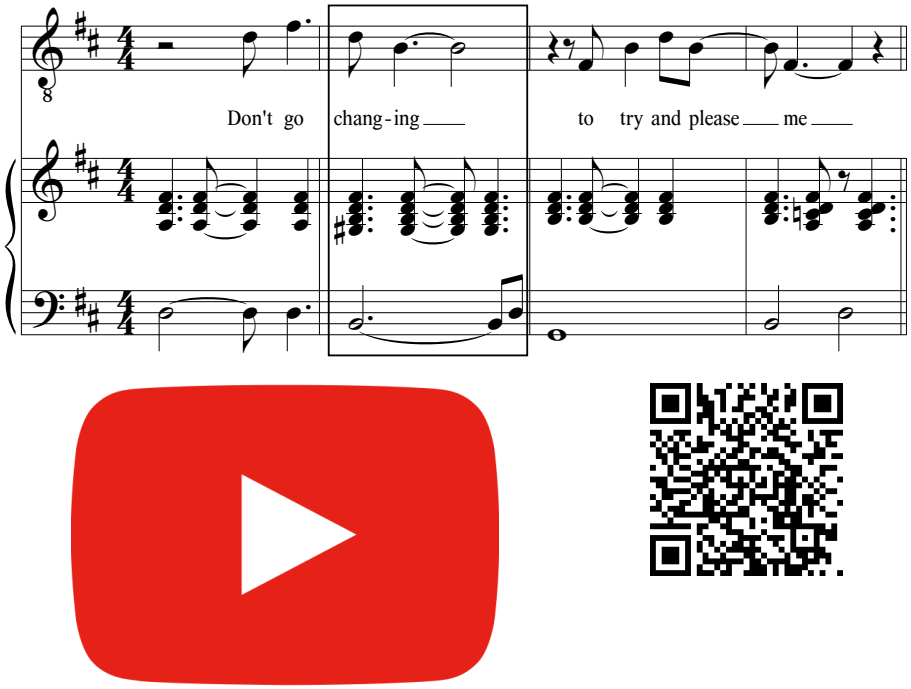


Figure 18.1.4 Billy Joel, "Just the Way You Are" (1977)

Figure 18.1.5 Dewayne Blackwell and Earl Bud Lee, "Friends in Low Places" (1990)

18.2 Secondary Diminished Chords in Major and Minor

Below are the secondary diminished chords that occur in major and minor.

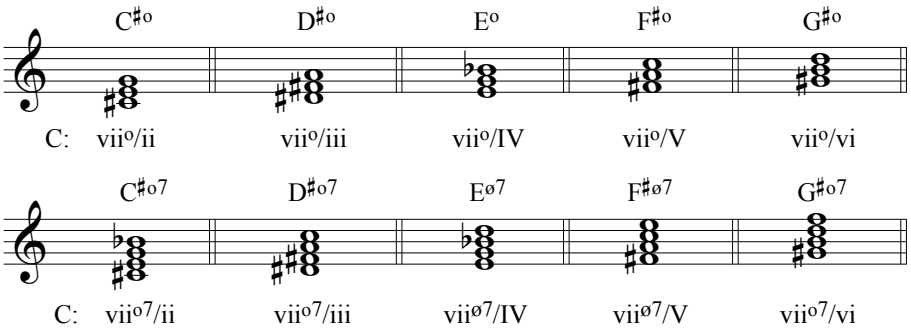


Figure 18.2.1 Secondary Diminished Triads and Seventh Chords in Major

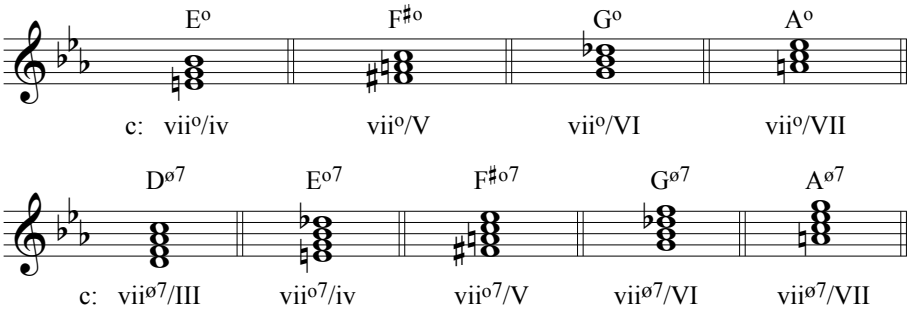


Figure 18.2.2 Secondary Diminished Triads and Seventh Chords in Minor

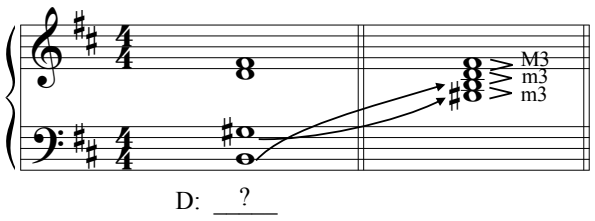
Notice that vii°/III in minor is not included because it is ii°. Notice also that $\text{vii}^{\text{ø}7}$/III has no accidentals—it is the same as $\text{ii}^{\text{ø}7}$ but functions differently. The $\text{ii}^{\text{ø}7}$ chord has pre–dominant function and progresses to V whereas the $\text{vii}^{\text{ø}7}$/III chord progresses to III.

Minor triads are tonicized by fully diminished seventh chords. Major triads are traditionally tonicized by half diminished seventh chords but can also be tonicized by fully diminished seventh chords.

18.3 Analyzing Secondary Diminished Chords

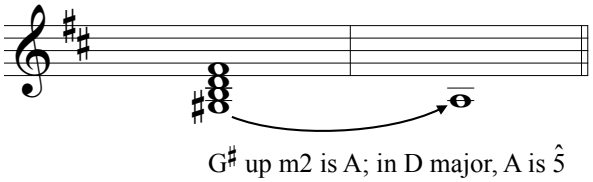
When you encounter a chord with a chromaticism and suspect it is a secondary diminished seventh chord, use the following process.

1. Stack the chord in thirds to determine the root and quality. If the chord quality is a diminished triad or a half–diminished or fully–diminished seventh chord, go on to step 2. If the chord quality is not a diminished triad or a half–diminished or fully–diminished seventh chord, the chord is not a secondary diminished chord.



The chord in question is an G♯ half–diminished seventh chord in first inversion.

2. Determine the note that would be a *minor 2nd above* the root of the chord you are analyzing. If this note of resolution would be the root of a diatonic chord, the chord you are analyzing is a secondary diminished chord.

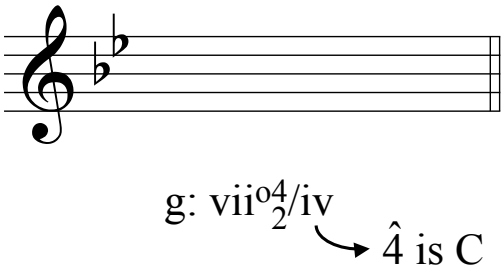


This $G^{\sharp\circ 7}/B$ is analyzed as $vii^{\circ 6}_{5}/V$ in D major.

18.4 Writing Secondary Diminished Chords

To write a secondary diminished chord, use the following procedure.

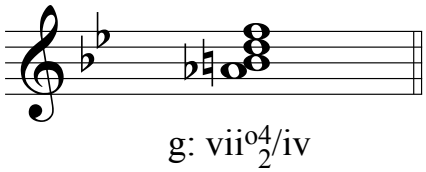
1. First determine the note that is the root of the chord being tonicized (the chord to the right of the slash).



2. Determine $vii^{\circ 7}$ in the key of C minor (C is the root of the iv chord, which is the Roman numeral *after* the slash): *B* is the root of $vii^{\circ 7}$ in C minor because it is a *m2 below* C.

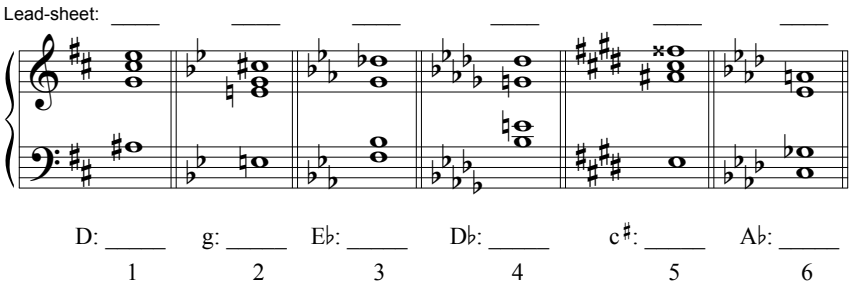
3. Build a fully–diminished seventh chord on B: *B–D–F–A♭*

4. Invert the chord accordingly. $\frac{4}{2}$ inversion means the 7th of the chord (A♭) is the bass note.

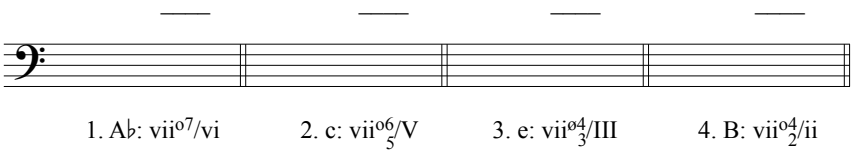


18.5 Practice Exercises

1. Analyze the following secondary diminished chords with lead–sheet symbols above and Roman numerals with figured bass symbols below.



2. Write the following secondary diminished chords. Include lead–sheet symbols above. Include key signatures.



3. Analyze the following excerpt with lead–sheet symbols above and Roman numerals with figured bass inversion symbols below. Analyze non–chord tones in parentheses.

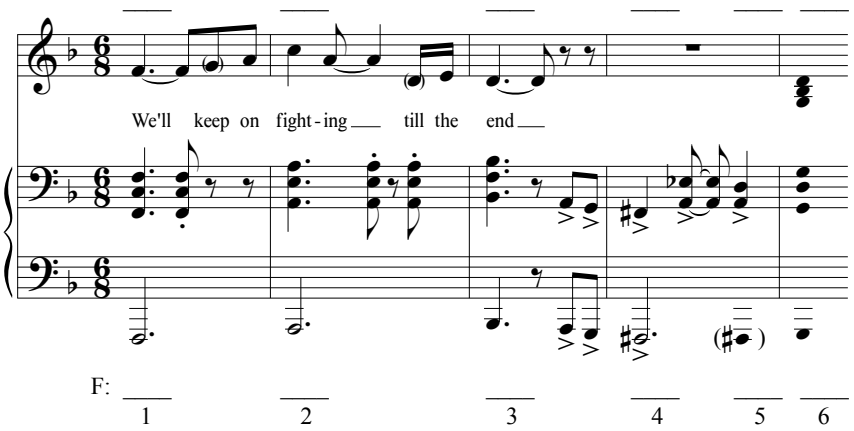


Figure 18.5.1 Freddie Mercury, "We Are the Champions" (1977)

Click here to download the first homework assignment for this chapter.
Click here to download the second homework assignment for this chapter.

Chapter 19

Mode Mixture

19.1 Mode Mixture

Mode mixture typically consists of borrowing chords from the parallel minor during a passage in a major key. "**Borrowed chords**" refers to borrowing chords from minor and is synonymous with mode mixture. In the examples that follow, notice the lowered chromaticisms—$\flat\hat{6}$ is most common but $\flat\hat{3}$ and $\flat\hat{7}$ also occur in borrowed chords.

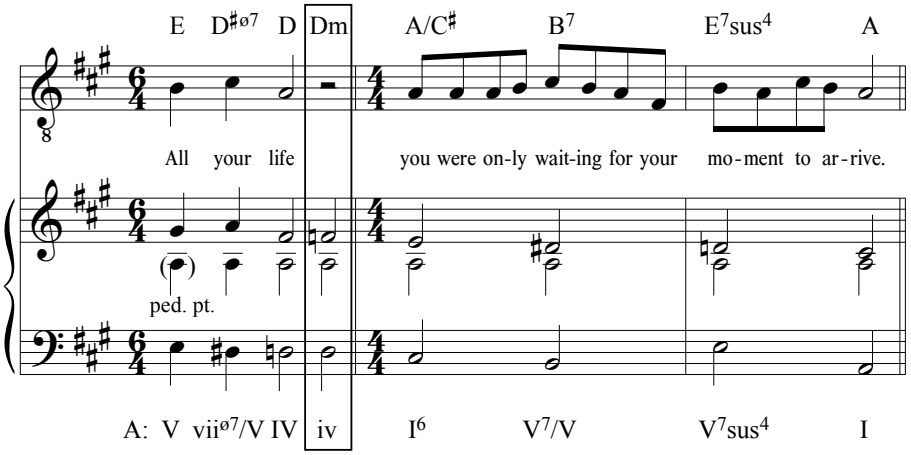


Figure 19.1.1 Lennon-McCartney, "Blackbird" (1968)

Notice the emotional effect of switching to the minor mode.

A famous example that progresses from the major I chord immediately to the minor i chord is Richard Strauss's *Also Sprach Zarathustra*.

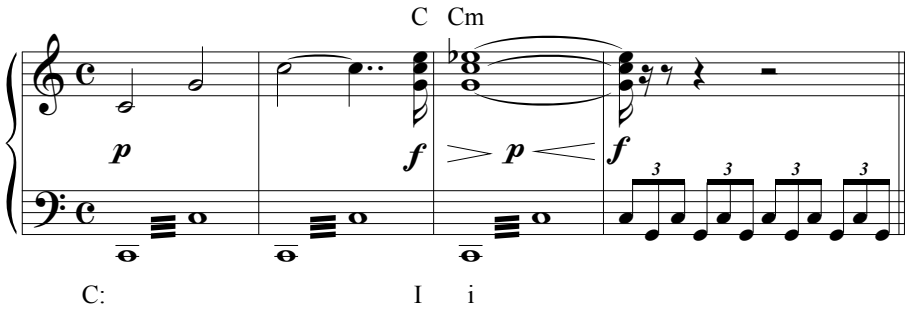


Figure 19.1.2 Richard Strauss, *Also Sprach Zarathustra*, Op.30 (1896)

Later during the opening of *Also Sprach Zarathustra*, another borrowed chord occurs.

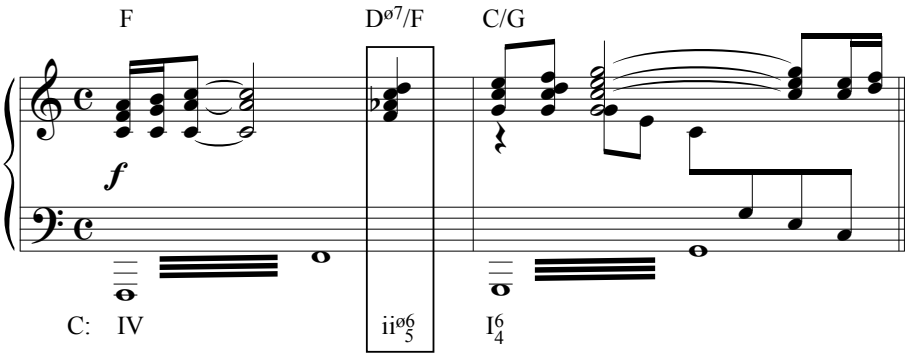


Figure 19.1.3 Richard Strauss, *Also Sprach Zarathustra*, Op.30 (1896)

The next three examples have the pattern $\hat{1}$–$\flat\hat{7}$–$\hat{6}$–$\flat\hat{6}$ in the bass line.

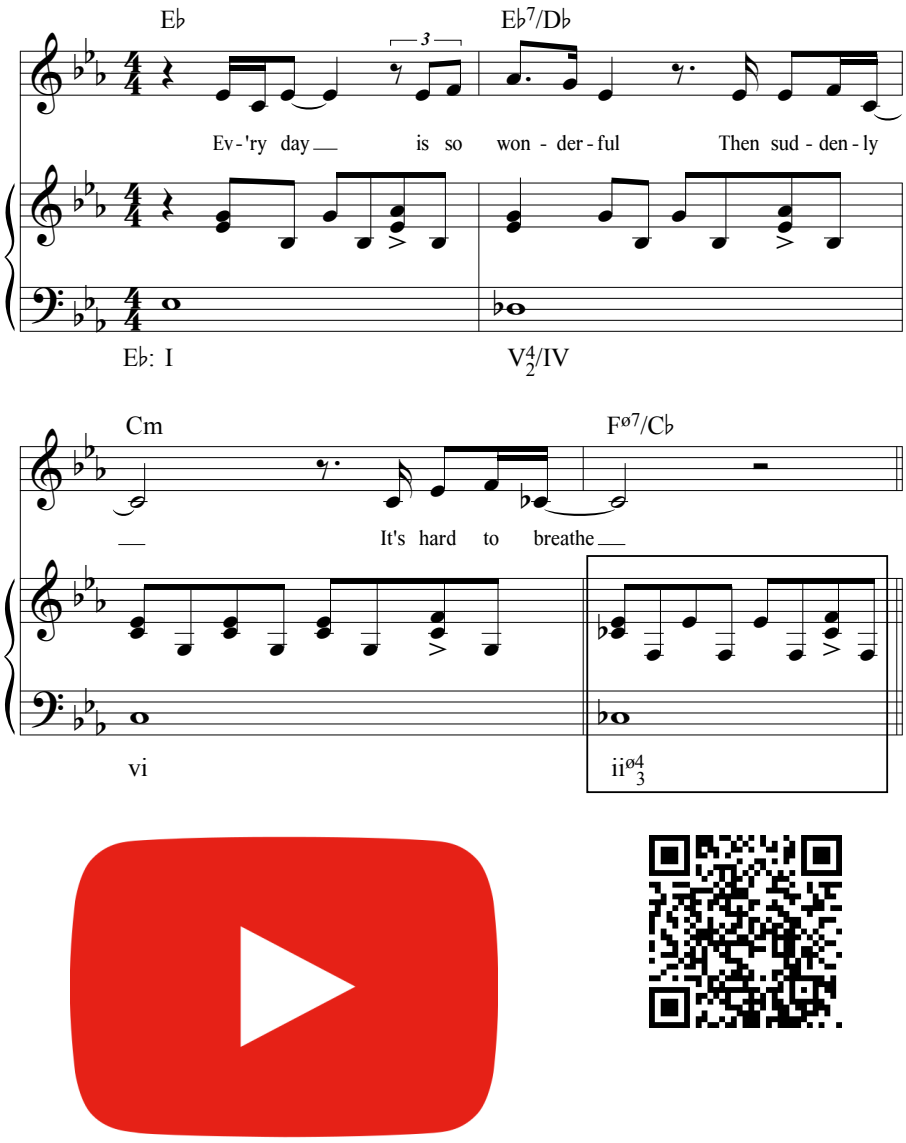


Figure 19.1.4 Linda Perry, “Beautiful” (2002)

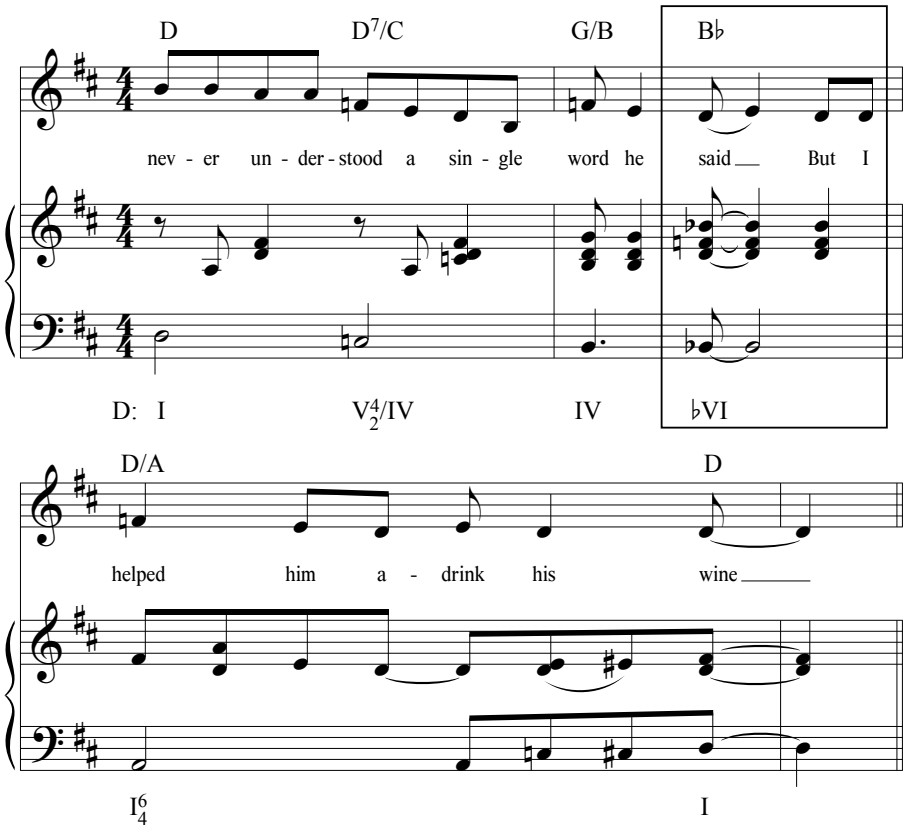


Figure 19.1.5 Hoyt Axton, "Joy to the World" (1970)

This same bass line can be found (in the same harmonic rhythm) in "Part of Your World."

Figure 19.1.6 Howard Ashman and Alan Menken, *The Little Mermaid*, "Part of Your World" (1989)

In the next example by Radiohead, the iv chord (borrowed from minor) is preceded by the major IV chord.

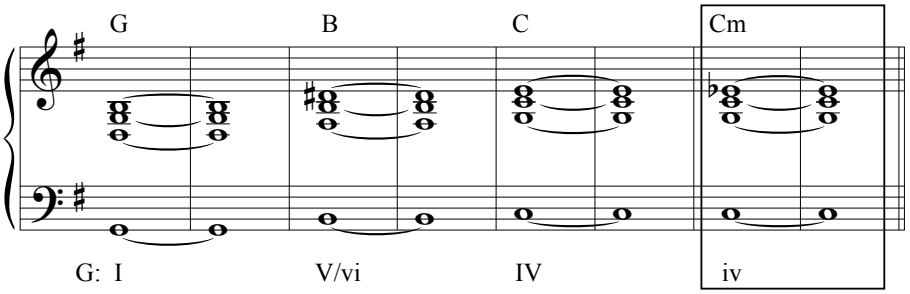


Figure 19.1.7 Thom Yorke, Jonny Greenwood, Colin Greenwood, Ed O'Brien, Philip Selway, Albert Hammond, and Mike Hazlewood, "Creep" (1992)

Mode mixture is also found in the music of the band Nirvana.

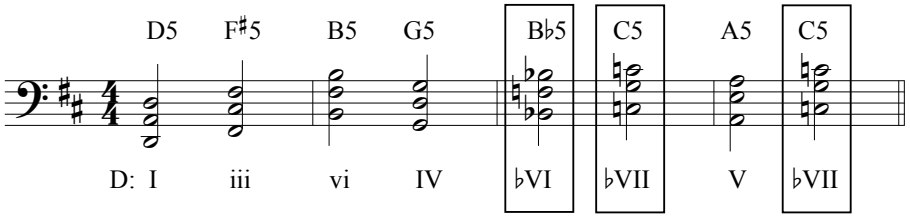


Figure 19.1.8 Kurt Cobain, "Lithium" (1992)

In the example above for "Lithium," the Roman numerals are analyzed as triads instead of "5" chords because the third of the chord is either implied or occurs in the voice part (not shown).

In the next example from the third movement Brahms's Third Symphony, the I chord alternates twice with a borrowed chord. There are three flats in the key signature because this movement began in C minor, but this section occurs later in the movement and is in C major.

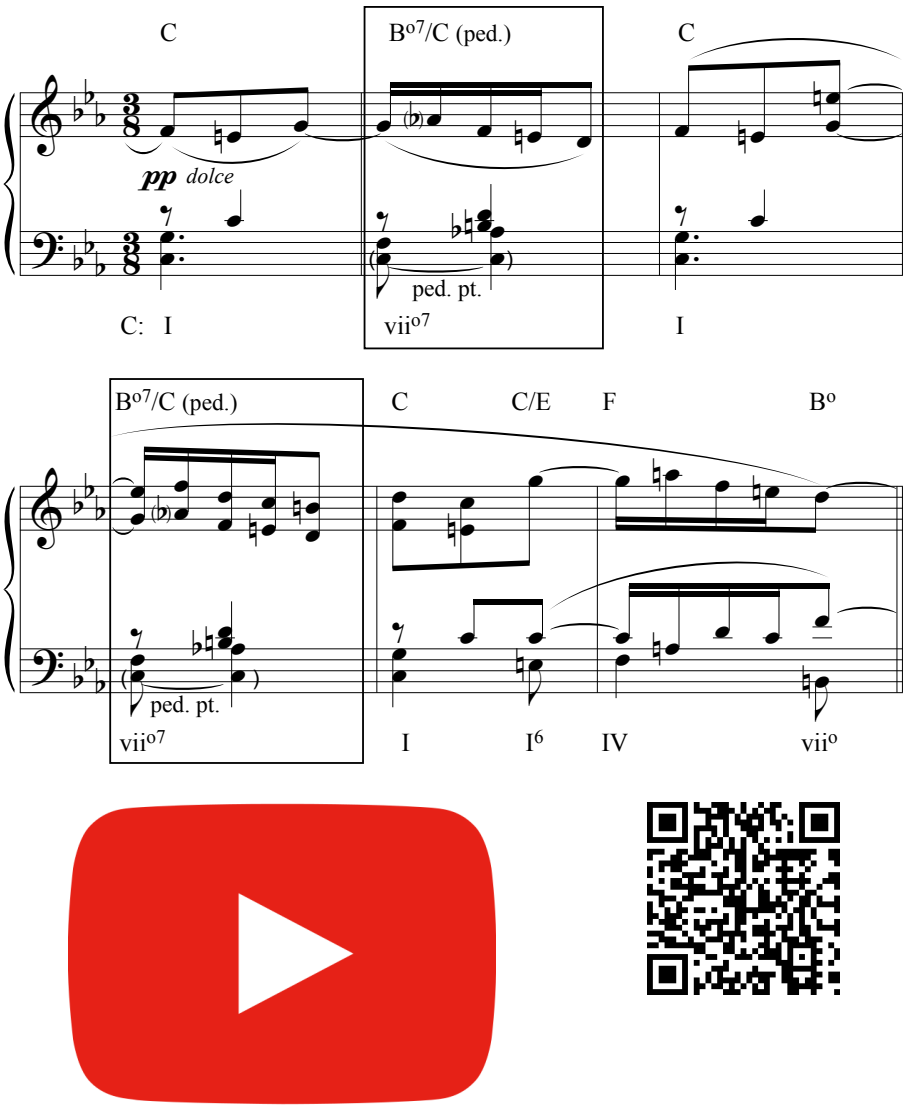


Figure 19.1.9 Johannes Brahms, *Symphony No. 3 in F major*, Op. 90, III. Poco Allegretto (1883)

A similar alternation between the I chord and a borrowed chord ($\flat$VII^7) happens in "Inchworm," from the movie *Hans Christian Andersen*. Notice the special quality of the borrowed $\flat\hat{6}$ in the upper melody.

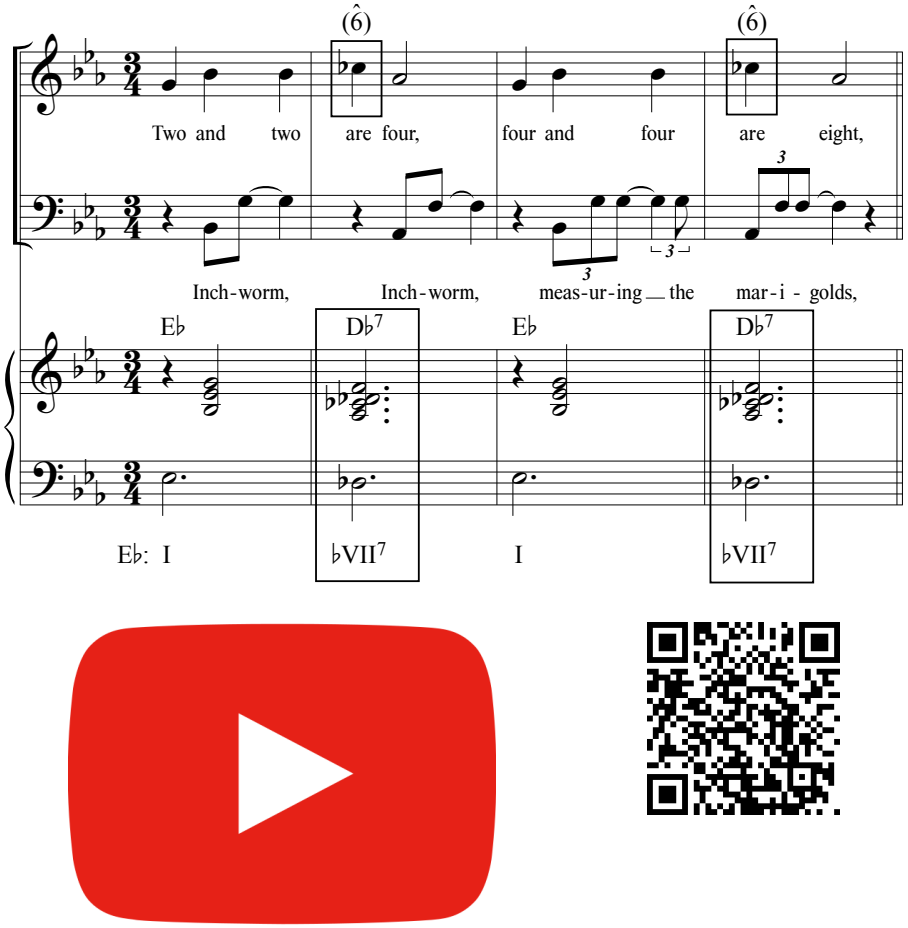


Figure 19.1.10 Frank Loesser, *Hans Christian Andersen*, "Inchworm" (1952)

A famous example of mode mixture occurs in the "Waltz of the Flowers" from Tchaikovsky's *Nutcracker*.

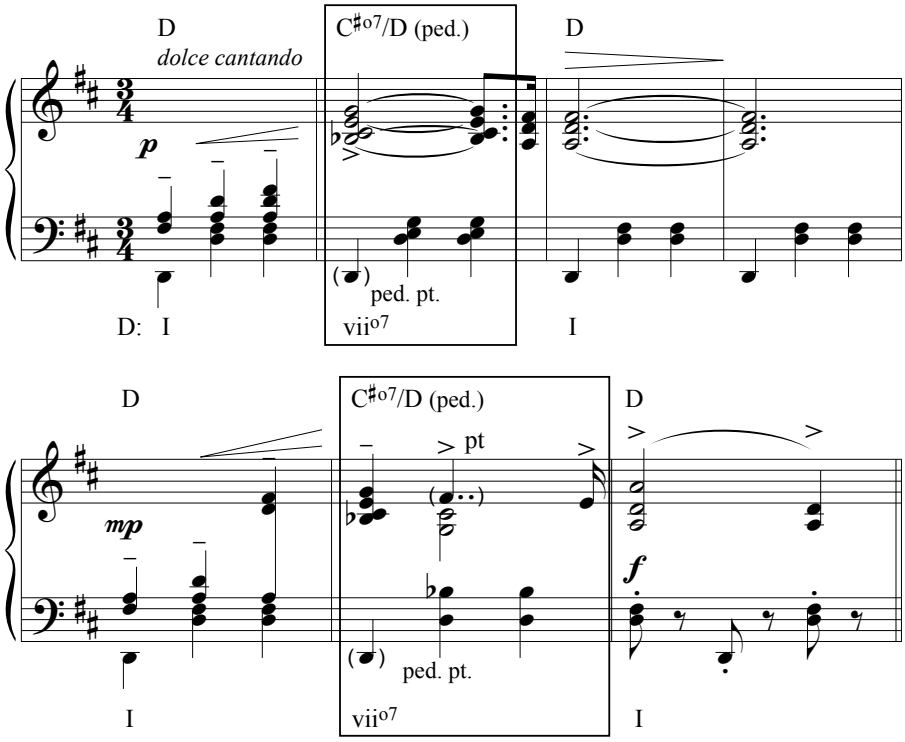


Figure 19.1.11 Tchaikovsky, *Nutcracker*, "Waltz of the Flowers" (1892)

A similar melody occurs in "One Day I'll Fly Away," which, though it has a different harmonization, still uses mode mixture.

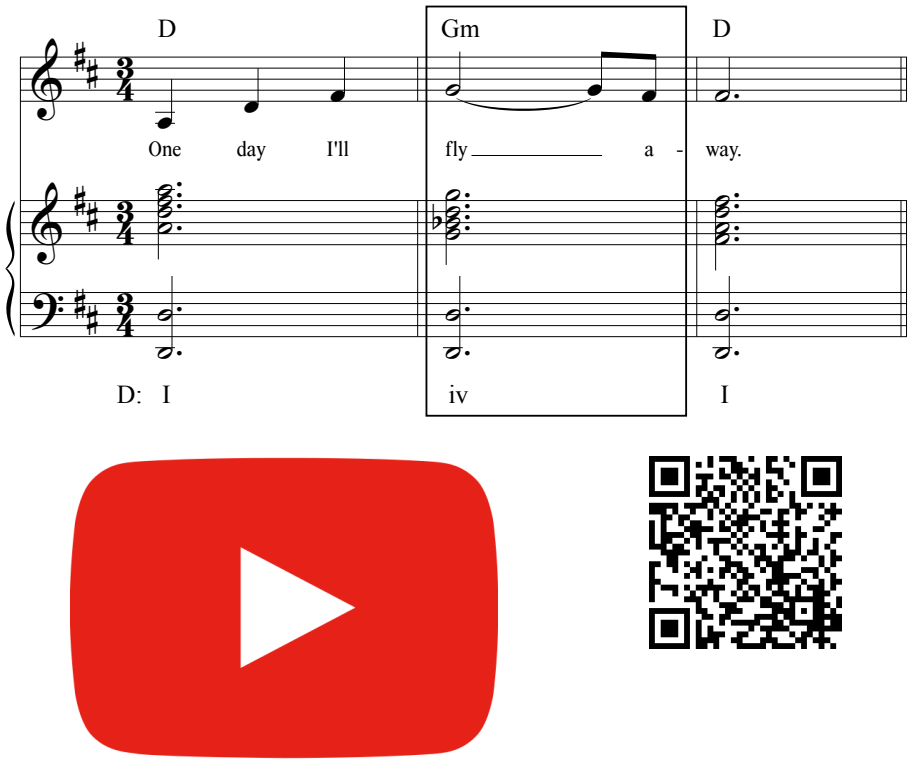


Figure 19.1.12 Joe Sample and Will Jennings, "One Day I'll Fly Away" (1980)

19.2 Harmonization of Borrowed Scale Degrees

Let us examine the ways ♭$\hat{6}$ can be harmonized as root, 3rd, 5th, and 7th of a borrowed chord.

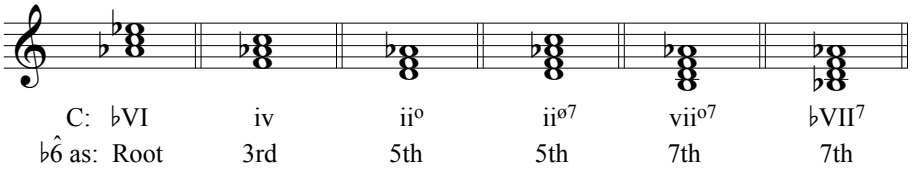


Figure 19.2.1 Harmonization of ♭$\hat{6}$

Here are the ways ♭$\hat{3}$ and ♭$\hat{7}$ can each be harmonized as root, 3rd, and 5th of a borrowed chord (notice some of these chords are duplicates from the previous example).

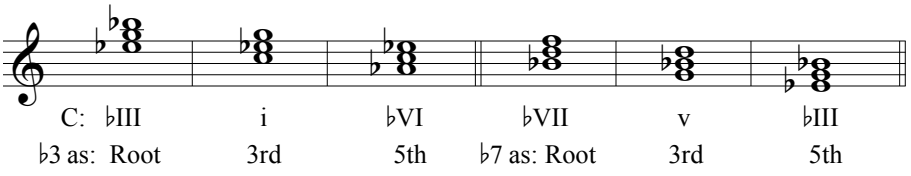


Figure 19.2.2 Harmonization of ♭$\hat{3}$ and ♭$\hat{7}$

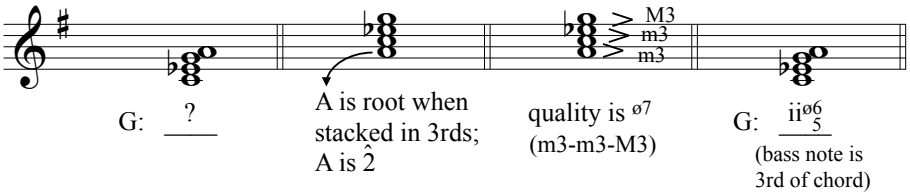
It is not necessary to memorize the chords in this section so much as to realize that the quality of diatonic chords will be altered when a scale degree

from the minor mode is included in the chord.

19.3 Analyzing and Writing Borrowed Chords

Unlike secondary chords, you merely note the root, quality, and inversion of a borrowed chord in your Roman numeral analysis.

So, for the following chord:

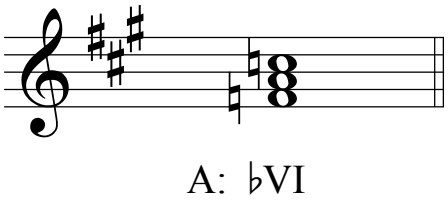


Notice that the root is A when you stack the notes in 3rds, and A is $\hat{2}$ in G major. The quality is half–diminished since the 3rds stack as m3–m3–M3, making this a ii^{ø7} chord. Since C, the 3rd of the chord, is in the bass, the correct analysis is ii$^{ø6}_{5}$.

To write a borrowed chord from a Roman numeral, be sure to *pay close attention to the quality of the Roman numeral.*

A: ♭VI

♭VI is built on ♭$\hat{6}$. Determine ♭$\hat{6}$ in A major, which is F♮, then stack 3rds in the configuration M3–m3. The resulting triad contains F♮–A–C♮.



Be careful of flats before Roman numerals. Flats mean to lower a root a m2 *in the key signature*, *not* to literally put a flat in front of the root of a chord.

19.4 The Deceptive Cadence with ♭VI

The V–♭VI deceptive cadence is a deceptive realization of a deceptive progression. This V–♭VI cadence ties into the ♭VI–♭VII–I progression to produce an "epic" (although somewhat clichéd) ending to the "Star Spangled Banner" as performed at the Super Bowl and Presidential Inaugurations by artists such as Whitney Houston, Beyoncé, and Lady Gaga, among others.

Figure 19.4.1 John Stafford Smith and Francis Scott Key, "The Star-Spangled Banner" (1814) as performed by Whitney Houston at the 1991 Super Bowl

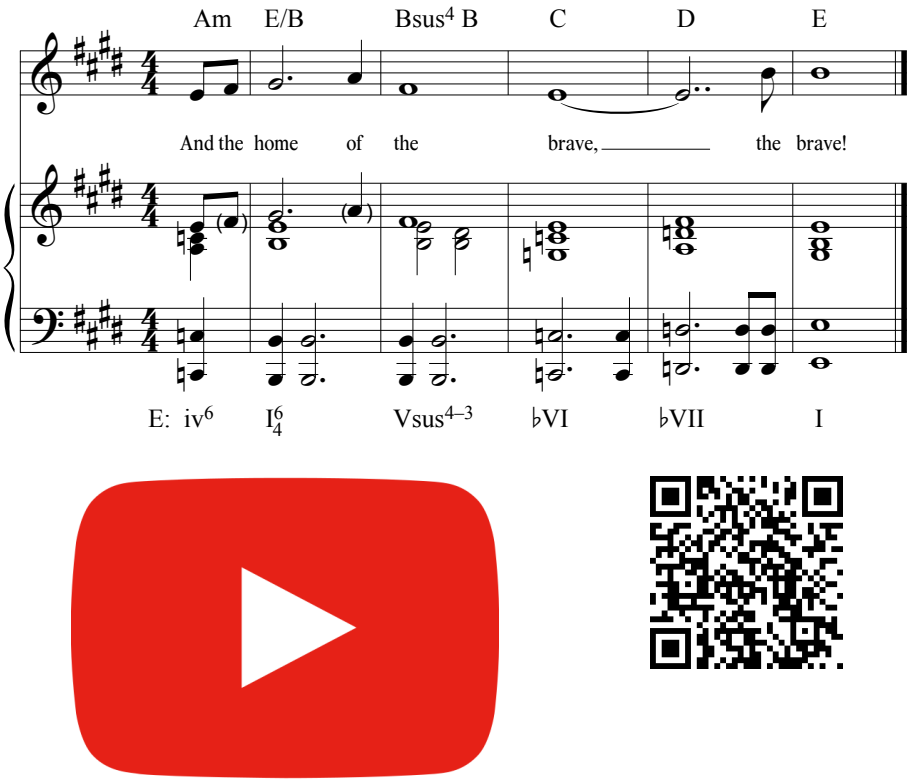


Figure 19.4.2 John Stafford Smith and Francis Scott Key, "The Star-Spangled Banner" (1814) as performed by Beyoncé at the 2013 Presidential Inauguration

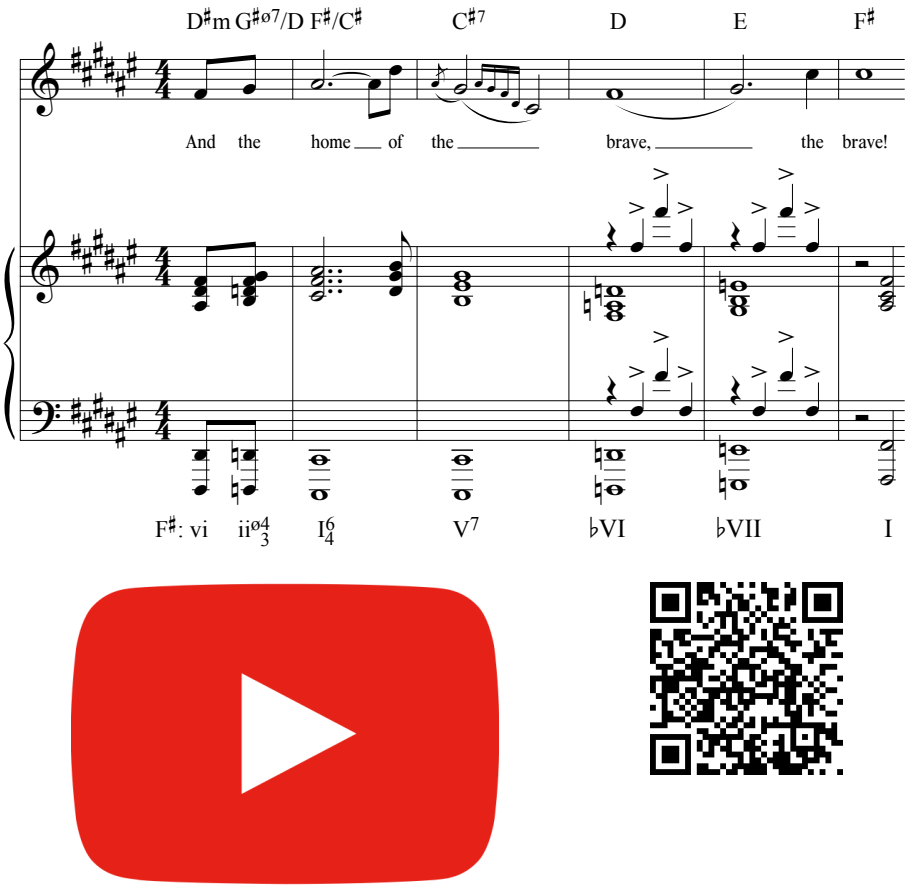


Figure 19.4.3 John Stafford Smith and Francis Scott Key, "The Star-Spangled Banner" (1814) as performed by Lady Gaga at the 2016 Super Bowl

This same V–♭VI deceptive cadence with ♭VI progressing to ♭VII followed by I occurs in epic fashion at the end of the animated film *Beauty and the Beast* from 1991.

19.5 The Picardy 3rd

It is rare to borrow from the major mode during a passage in a minor key. The major tonic usually functions as V/iv if it's not the last chord of a piece, and raised $\hat{6}$ and $\hat{7}$ occur naturally as part of the melodic minor scale.

In minor, the one place to borrow from the major mode is at the end of a piece in minor, with the use of the major I chord instead of minor i.

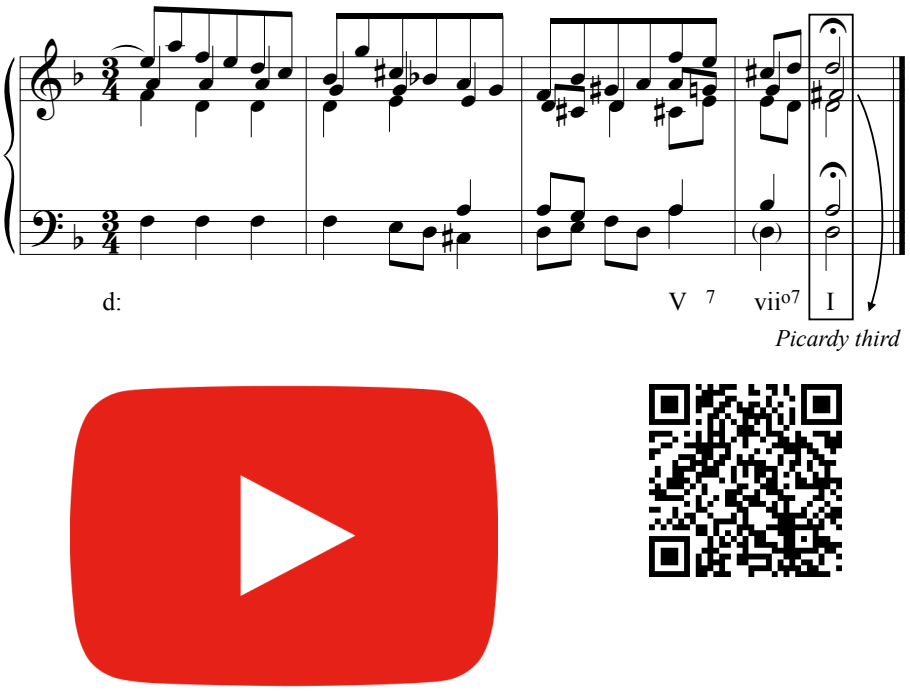
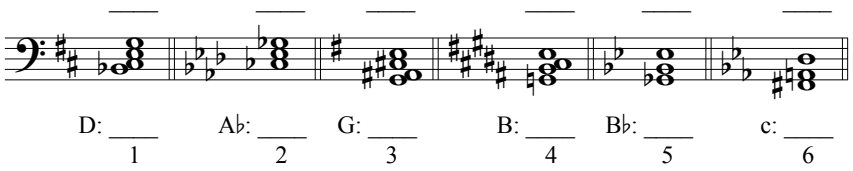


Figure 19.5.1 J.S. Bach, French Suite No. 1 in D Minor, BWV 812, Sarabande

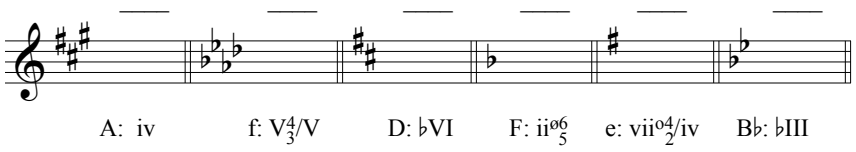
While the Picardy 3rd (the major third above the tonic) was most commonly encountered in the Baroque era, it has been used from then until now, though with less frequency.

19.6 Practice Exercises

1. Analyze the following chords with lead–sheet symbols above and Roman numerals with figured bass inversion symbols below.



2. Given the Roman numeral, key, and key signature, notate the chord on the staff, and analyze with lead–sheet symbols.



3. Analyze the following excerpt with lead–sheet symbols above and Roman numerals with figured bass inversion symbols below. Analyze notes that are non–chord tones by putting parentheses around them and specifying them by type.

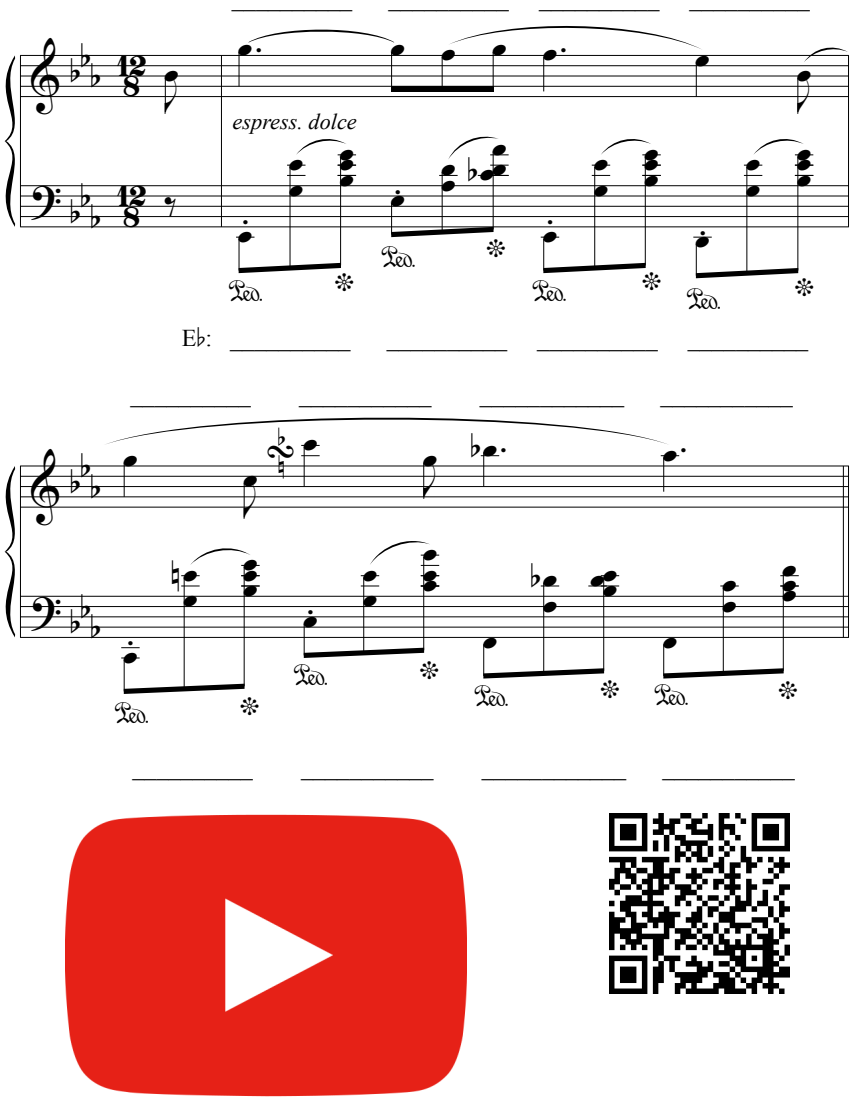


Figure 19.6.1 Frédéric Chopin, Nocturne in E-flat major, Op. 9, No. 2 (1832)

Click here to download the homework assignment for this chapter.

PDF versions of the textbook, homework exercises, and practice exercises can be found at musictheory.pugetsound.edu

Chapter 20

The Neapolitan Chord

20.1 The Neapolitan Chord

The label "**Neapolitan**" is used in classical music for the ♭II chord and is labeled as "N" instead of ♭II. For example, when the Neapolitan chord occurs in first inversion—its most common inversion—it is labeled as N^6.

Being a chromatically altered ii chord, the Neapolitan has pre–dominant harmonic function.

Notice the special character of the Neapolitan and how composers sometimes alter texture, register, and dynamics when the Neapolitan occurs, as in the first movement of Beethoven's Symphony No. 7, Op. 92.

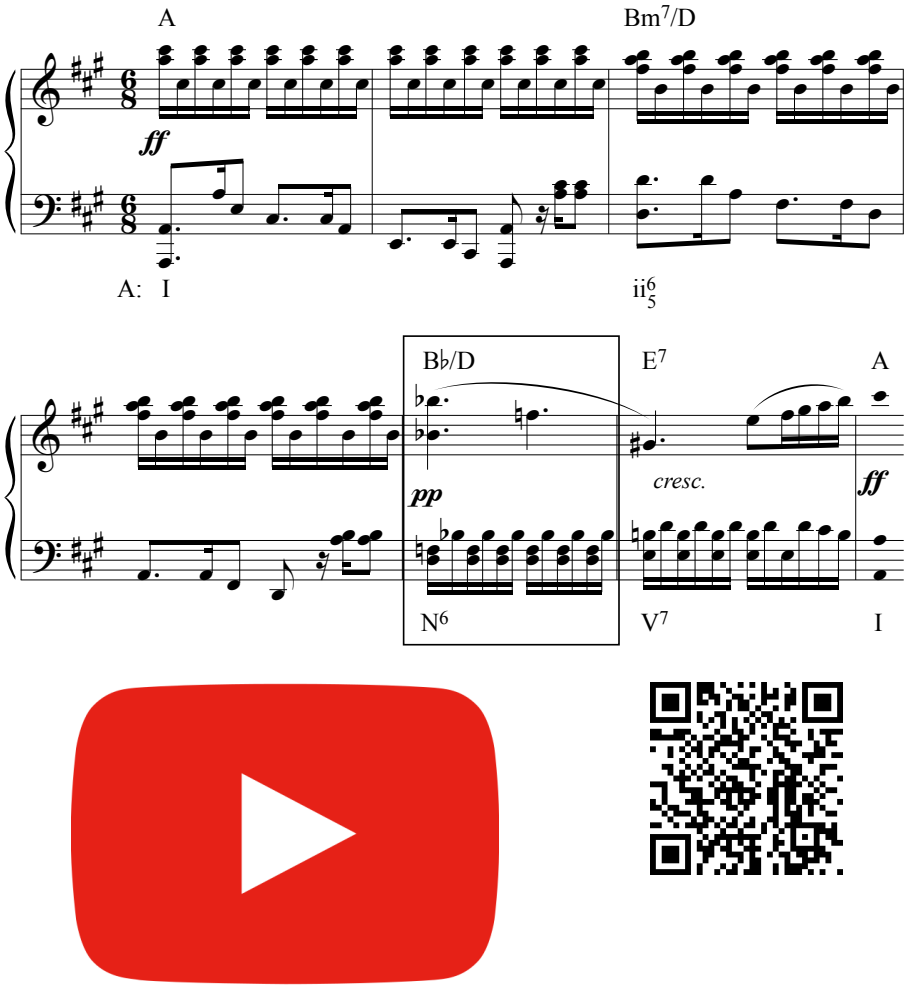


Figure 20.1.1 Beethoven, Symphony No. 7, Op. 92, I (1812)

20.2 Examples of the Neapolitan Chord

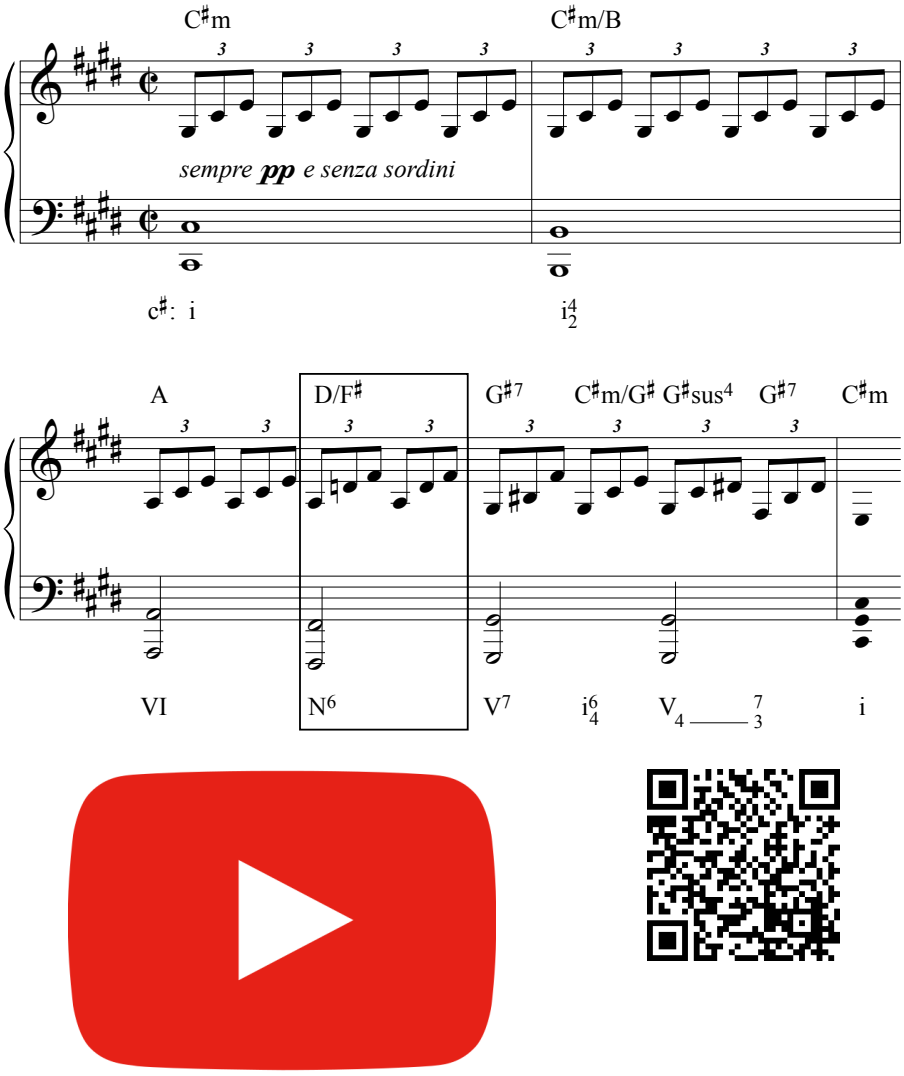


Figure 20.2.1 Beethoven, *Moonlight Sonata*, Op. 27, No. 2, I (1802)

For comparison, play the example above from the *Moonlight Sonata* and try other pre–dominant chords in its place, like iv ($F^{\sharp}m$) or $ii^{\circ 6}$ ($D^{\sharp\circ}/F^{\sharp}$), while noting the difference in effect.

The next example is a well-known movie theme.

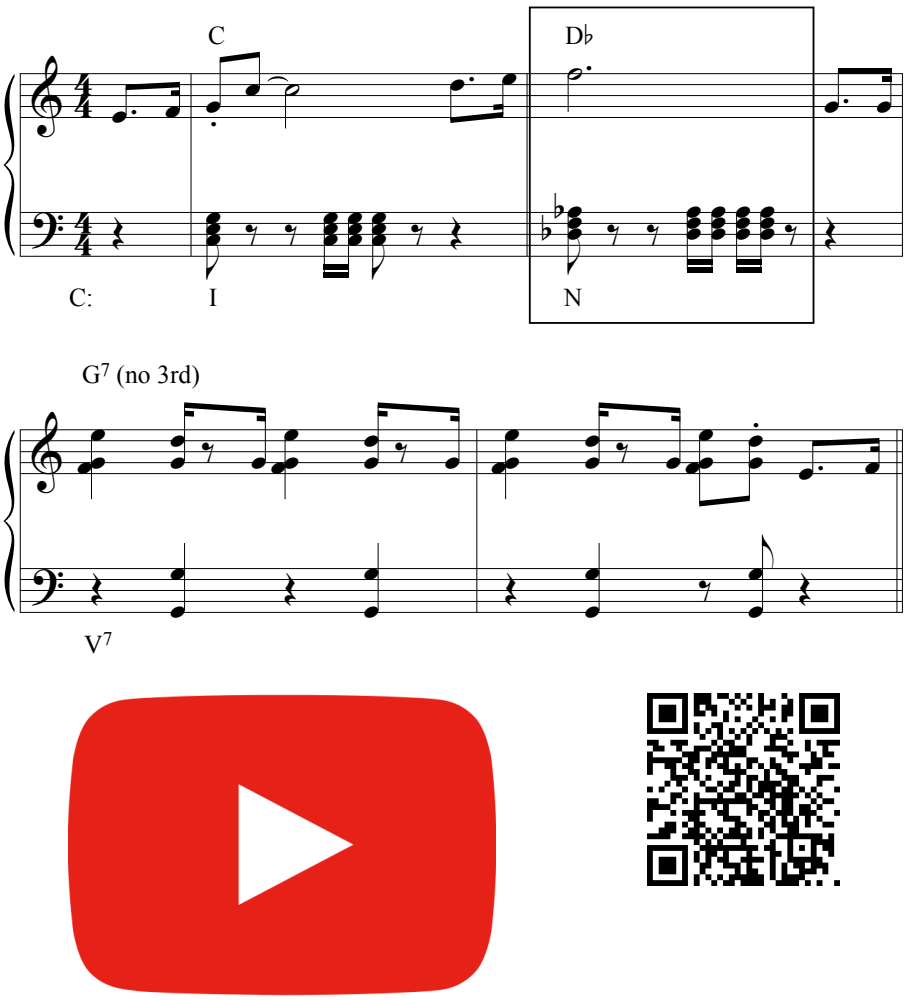


Figure 20.2.2 John Williams, *Raiders of the Lost Ark*, "Raiders March" (1981)

As with the example from the *Moonlight Sonata*, try other pre–dominant chords (like IV, iv, or $\text{ii}^{\text{ø}6}_{5}$) in place of the Neapolitan chord in the example above, and notice the difference in effect.

The next example shows the harmonic progression from main theme of the recent *Star Trek* movies.

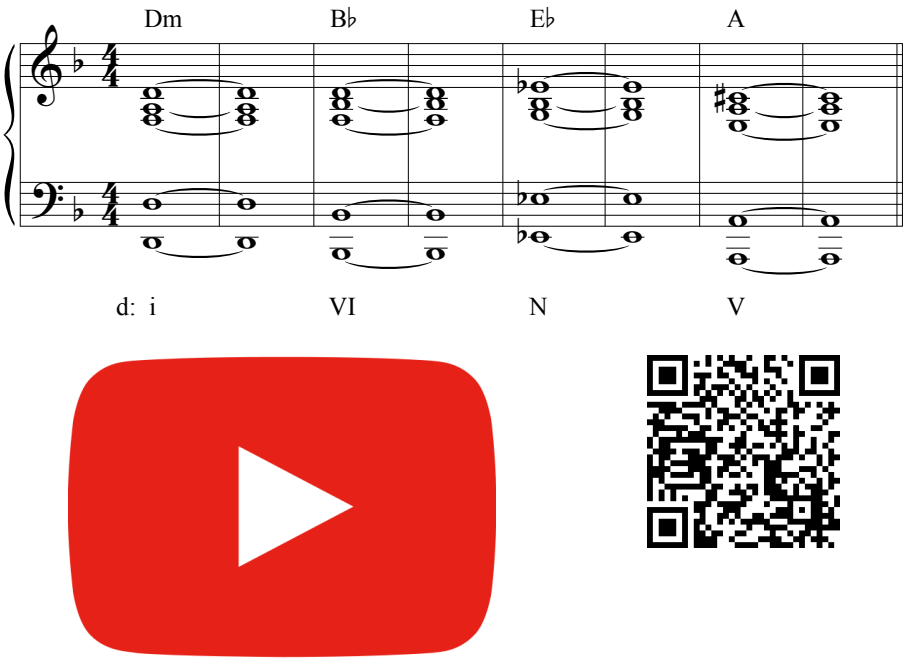


Figure 20.2.3 Michael Giacchino, *Star Trek*, "End Credits" (2009) (chords only)

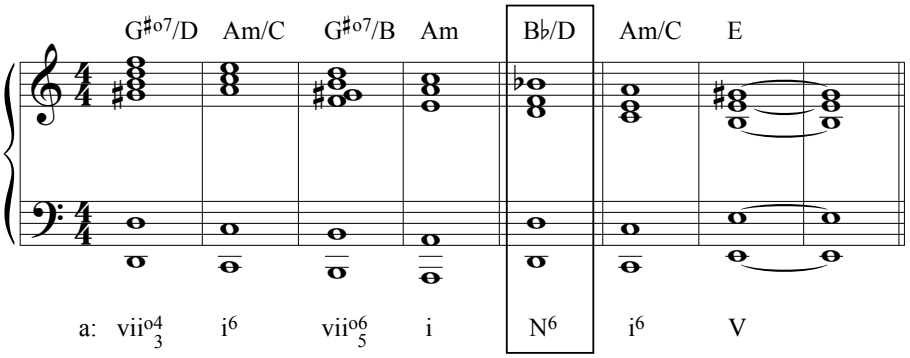
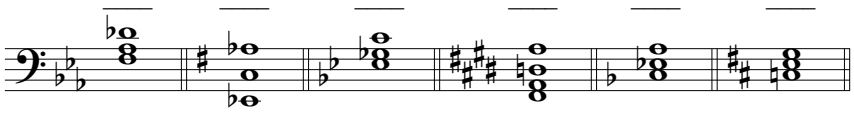


Figure 20.2.4 Hans Zimmer and Antonius Tom Holkenborg, *Batman v Superman: Dawn of Justice*, "The Red Capes are Coming" (2016) (chords only)

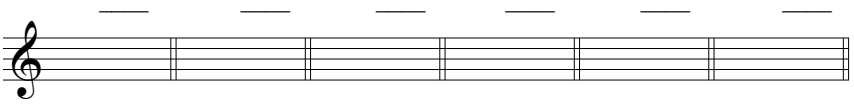
20.3 Practice Exercises

1. Analyze the following chords with lead–sheet symbols above and Roman numerals with figured bass inversion symbols below. Remember to use "N" instead of ♭II.



c: ____ G: ____ B♭: ____ c♯: ____ d: ____ b: ____
1 2 3 4 5 6

2. Given the Roman numeral, please write the notes of the chord and lead–sheet symbol. Include key signatures.



1. E♭: N^6 2. a: N 3. D: ♭III 4. c: vii^{o7}/V 5. B♭: $ii^{ø4}_2$ 6. G: N^6

Click here to download the homework assignment for this chapter.

Chapter 21

Augmented Sixth Chords

21.1 Augmented Sixth Chords

Augmented sixth chords are a special class of pre-dominant chords with notes that approach the dominant ($\hat{5}$) from a half-step below ($\sharp\hat{4}$) and from a half-step above ($\flat\hat{6}$) simultaneously.

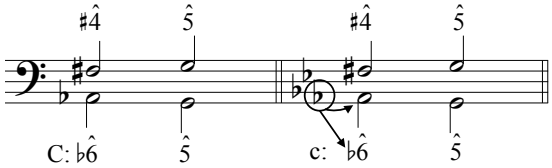


Figure 21.1.1

In minor, $\flat\hat{6}$ doesn't require a flat because $\hat{6}$ is lowered in the minor key signature.

21.2 Types of Augmented Sixth Chords

There are three general types of augmented sixth chords—the **Italian augmented sixth chord** ("It^{+6}"), the **French augmented sixth chord** ("Fr^{+6}"), and the **German augmented sixth chord** ("Ger^{+6}"). These geographic labels have persisted throughout the years despite the fact that no reasoning has been found for these designations. [1]

All types of augmented sixth chords contain scale degrees $\flat\hat{6}$ and $\sharp\hat{4}$. To these two scale degrees, the It^{+6} adds $\hat{1}$. The three notes of the It^{+6} ($\flat\hat{6}$, $\sharp\hat{4}$, and $\hat{1}$) form the foundation of the Fr^{+6} and Ger^{+6}. The Fr^{+6} adds $\hat{2}$ to the Italian augmented sixth chord's $\flat\hat{6}$, $\sharp\hat{4}$, and $\hat{1}$, and the Ger^{+6} adds $\flat\hat{3}$ to the Italian's $\flat\hat{6}$, $\sharp\hat{4}$, and $\hat{1}$, as is shown in the example below.

[1] The 1964 *Harvard Dictionary of Music* states these chords are "rather pointlessly... distinguished as 'Italian,' 'German,' and 'French' sixth..."

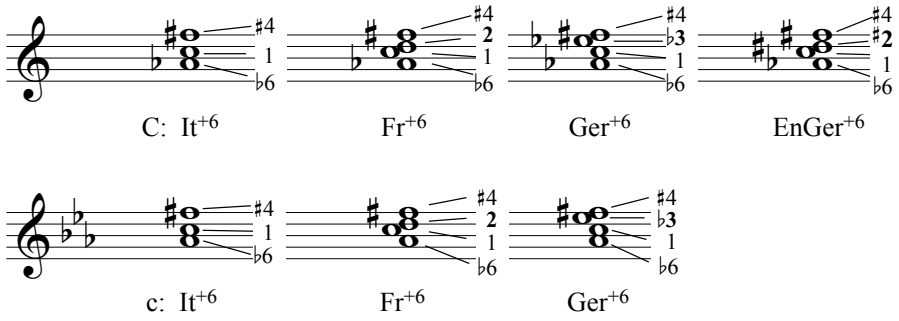


Figure 21.2.1 The Three Types of Augmented Sixth Chords in Major and Minor

The final chord on the first line—the Enharmonic German $^{+6}$ or EnGer^{+6}—respells the $\flat\hat{3}$ as a $\sharp\hat{2}$ because the EnGer^{+6} resolves only to major I^6_4. The EnGer^{+6} does not occur in minor.

21.3 Analyzing Augmented Sixth Chords

Since our process for analyzing chords has been to stack them up in thirds to determine the root and quality, it is worth examing these four augmented sixth chords as stacks of thirds.

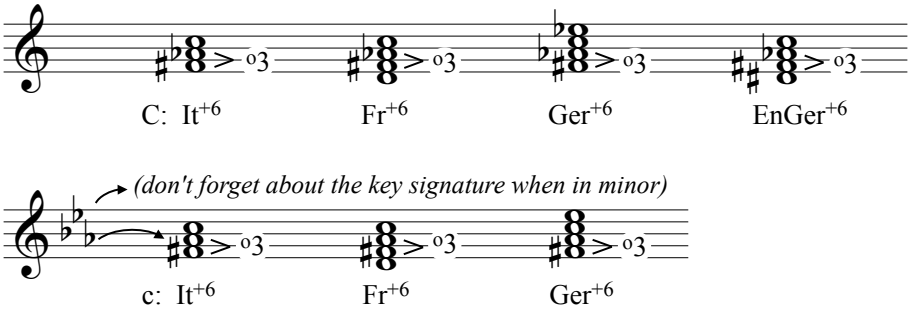


Figure 21.3.1 Augmented Sixth Chords Stacked in Thirds

Notice that all augmented sixth chords contain a $^\circ 3$ when stacked in 3rds. None of the chords we have studied so far contain diminished thirds.

Principle 21.3.2 Augmented Sixth Chords. *When you encounter a chord with a diminished third, it is an augmented sixth chord.*

Once you determine the chord you are analyzing has a $^\circ 3$, *analyze the scale degrees* to determine which type of augmented sixth chord it is.

21.4 Lead-Sheet Analysis of Augmented Sixth Chords

When using lead-sheet symbols for augmented sixth chords, we will treat them as major-minor seventh chords built on $\flat\hat{6}$, since that matches the sonic quality of the augmented sixth chords and is similar to how they occur and are spelled in jazz and popular music. The chords in parentheses are enharmonic respellings of the three augmented sixth chord types.

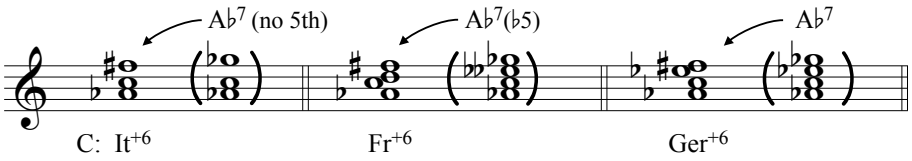


Figure 21.4.1 Augmented Sixth Chords Stacked in Thirds

In the example above, we see a disagreement between "classical" analysis and lead-sheet analysis. The fundamental concept of lead-sheet analysis is to show root, quality, and inversion. The "classical" spelling and the classical analysis of augmented sixth chords show the direction of resolution (with the chromatically raised notes), which necessitate the need for original labels, since we don't have a Roman numeral or a lead-sheet symbol that would communicate a chord containing a diminished third above the root (that is then inverted!).

Therefore, when you are asked to provide lead-sheet symbols for augmented sixth chords, analyze each one as if it is a dominant 7th chord with a misspelled 7th ($A^{\flat}$–C–$E^{\flat}$–$F^{\sharp}$ instead of $A^{\flat}$–C–$E^{\flat}$–$G^{\flat}$).

21.5 Examples with Augmented Sixth Chords

21.5.1 The Italian Augmented Sixth Chord

The first examples, from the first movement of Beethoven's Fifth Symphony, shows an Italian augmented sixth chord (It^{+6}) in C minor with the "classical" spelling.

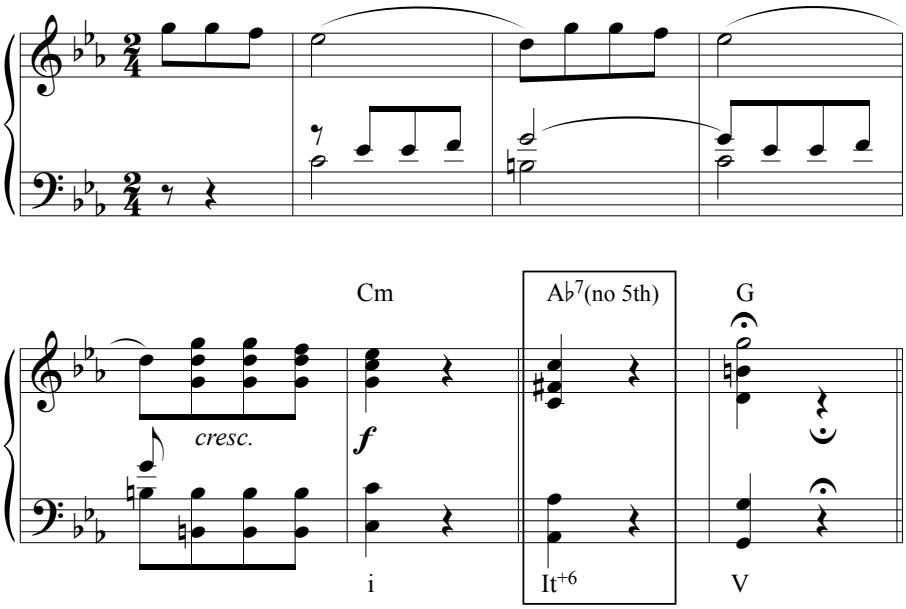


Figure 21.5.1 Beethoven, Symphony No. 5, Op. 67, I (1808)

The next example from popular music has an It^{+6} spelled enharmonically as a major-minor seventh chord with the fifth omitted.

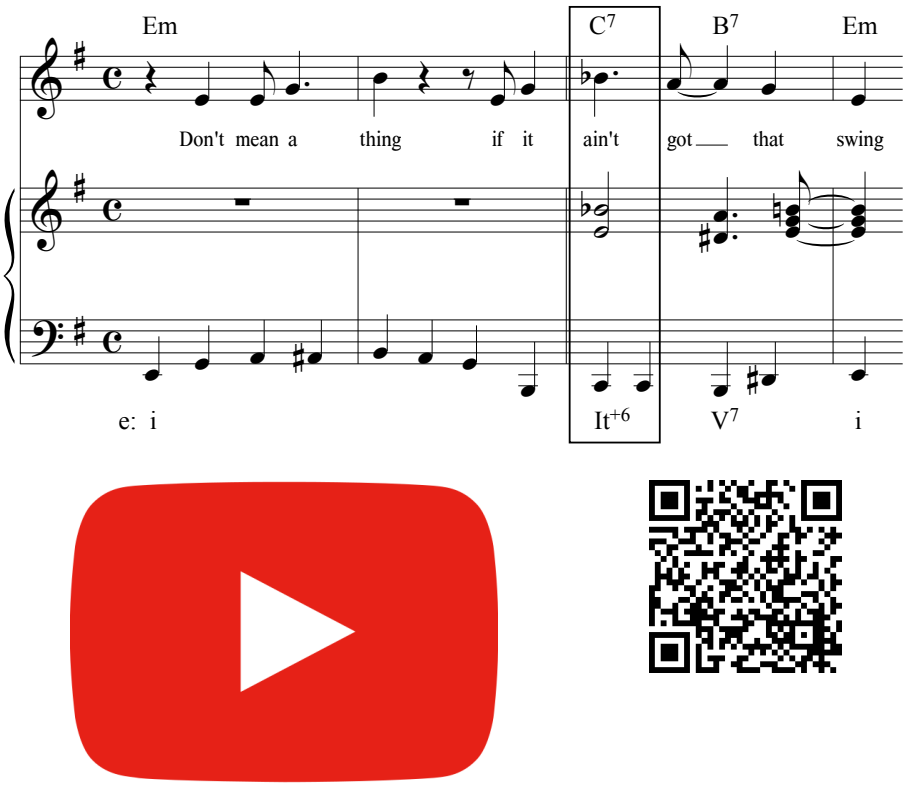


Figure 21.5.2 Duke Ellington, "It Don't Mean A Thing (If It Ain't Got That Swing)" (1931)

21.5.2 The French Augmented Sixth Chord

The next example contains an example of a French augmented sixth chord (Fr^{+6}). Notice how the French augmented sixth chord has pre-dominant function and intensifies the drive toward the V chord.

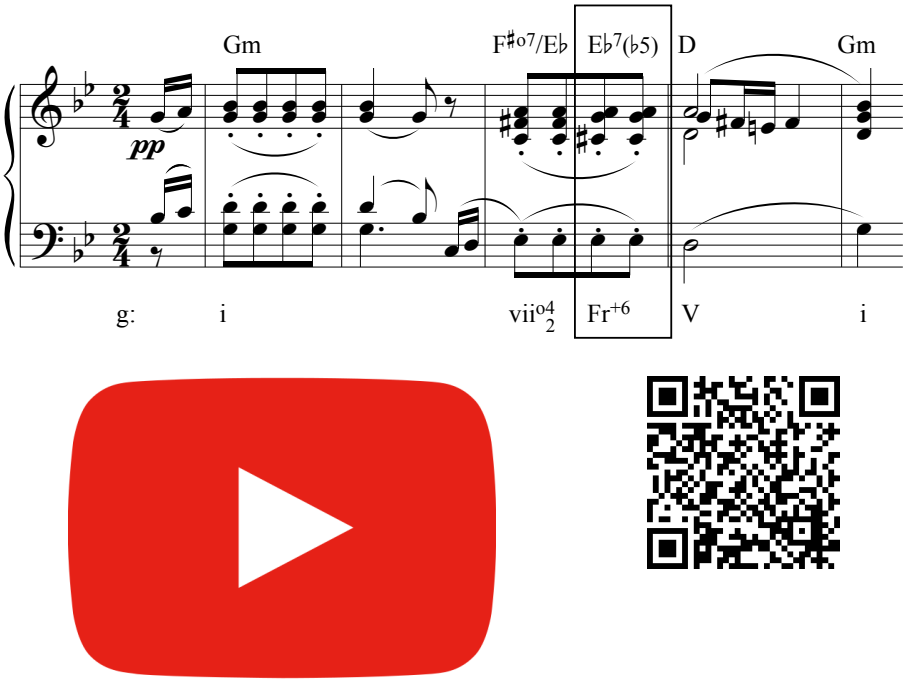


Figure 21.5.3 Schubert, *Winterreise*, D. 911, "Der Wegweiser" (1823)

21.5.3 The German Augmented Sixth Chord

The following example, from Rossini's *William Tell* Overture, has a German augmented sixth chord leading to a chord of dominant function, the I^6_4 chord.

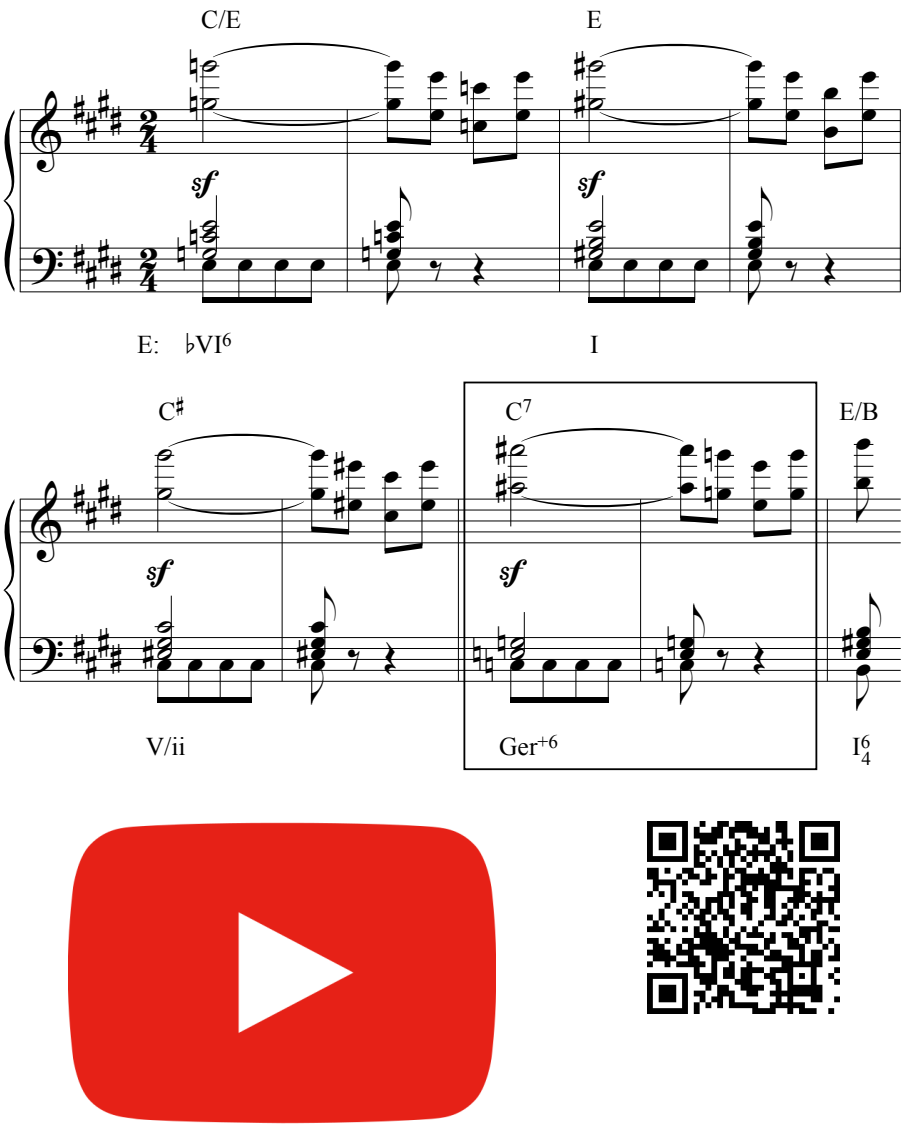


Figure 21.5.4 Gioachino Rossini, *William Tell* Overture (1829)

John Coltrane's minor blues, "Mr. P.C.," contains a German augmented sixth chord (spelled as VI^7 in minor) progressing to the V chord. (Note: The bass line in this example is a jazz "walking" bass, which doesn't stick strictly to chord tones.)

Figure 21.5.5 John Coltrane, "Mr. P.C." (1959)

The next example is a movie theme and features a German augmented sixth chord spelled as a major-minor seventh chord (VI^7). In this particular case, the third of the chord doesn't occur until the fourth beat of the measure.

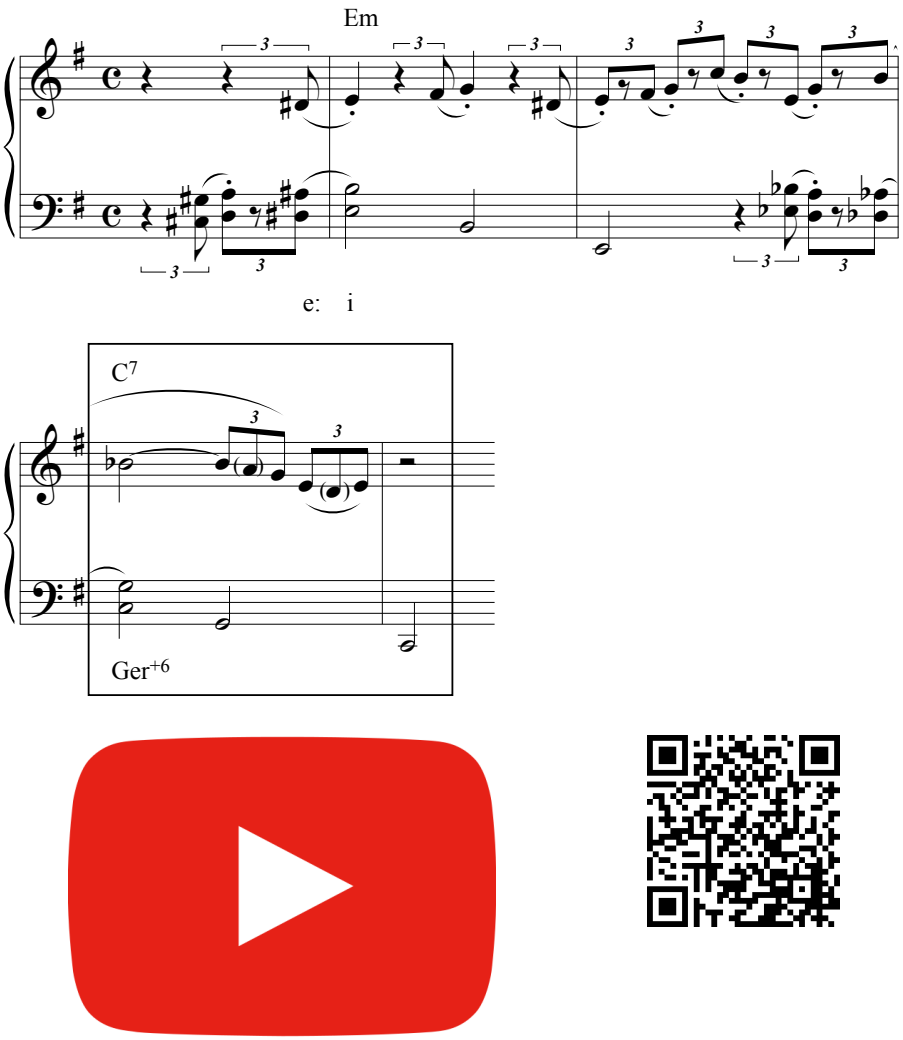


Figure 21.5.6 Henry Mancini, "The Pink Panther Theme" (1963)

Fiona Apple's "Criminal," from 1996, features German augmented sixth chords in the verse (F^7 in the key of A minor) as well as in the pre-chorus, seen in the example below.

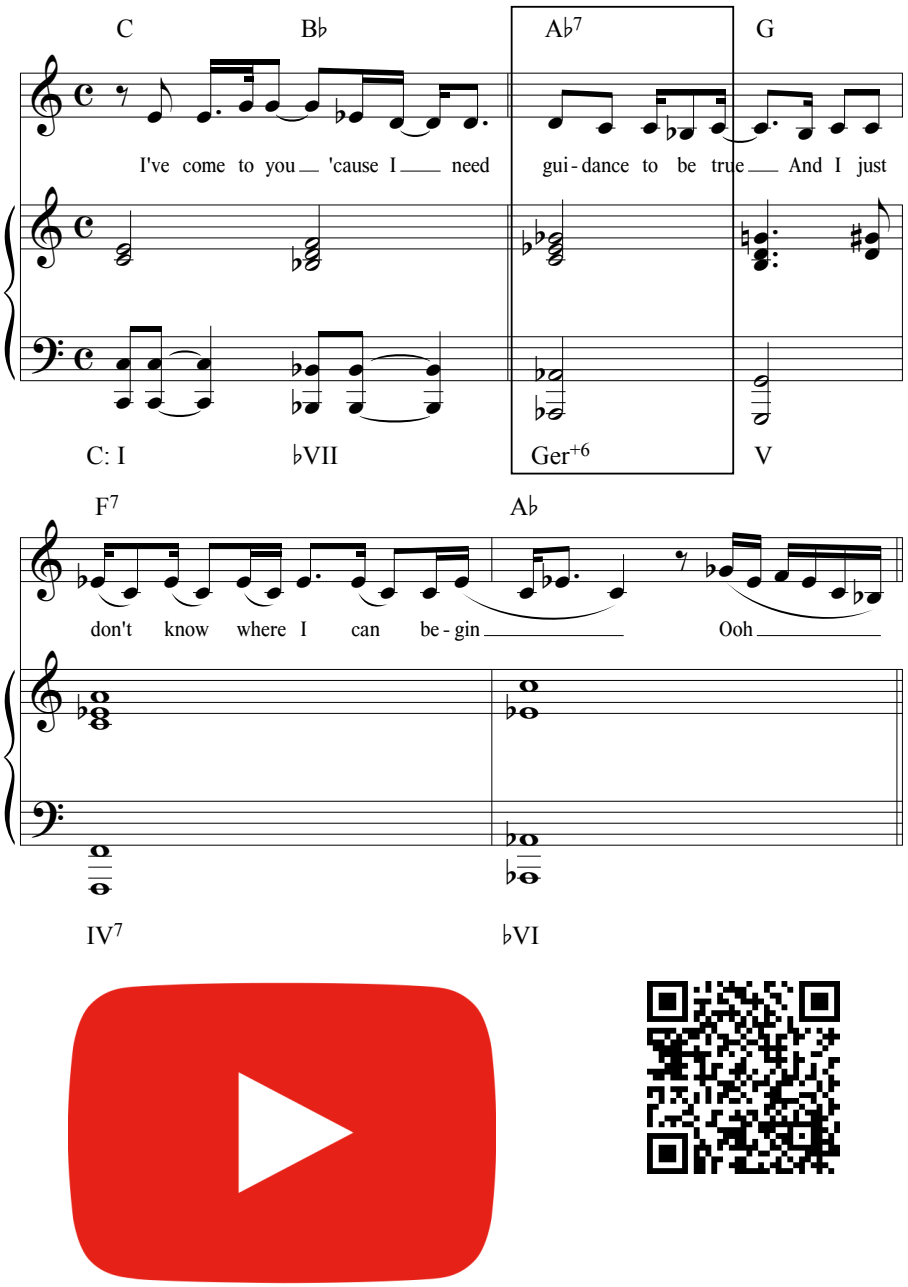


Figure 21.5.7 Fiona Apple, "Criminal" (1996)

A repeating progression of Am–F^7–E (i–Ger^{+6}–V in Roman numerals) occurs in "Friend Like Me" from the movie and musical *Aladdin*.

Figure 21.5.8 Alan Menken and Howard Ashman, *Aladdin*, "Friend Like Me" (1992)

21.5.4 The Enharmonic German Sixth

In the following example an "Enharmonic German augmented sixth" chord occurs. While a $G^{\flat 7}$ chord would normally have the notes $G^{\flat}$–$B^{\flat}$–$D^{\flat}$–$F^{\flat}$, the F♭ is respelled as an E♮, creating the interval of an augmented sixth, while the fifth of the chord, D♭, is respelled as a C♯, creating the interval of a doubly augmented fourth. In fact, some music theory textbooks refer to the Enharmonic German augmented sixth chord as "the chord of the doubly-augmented fourth." The spelling is this way because the C♯ will resolve upward to a D♮, the third of a major I^6_4 chord.

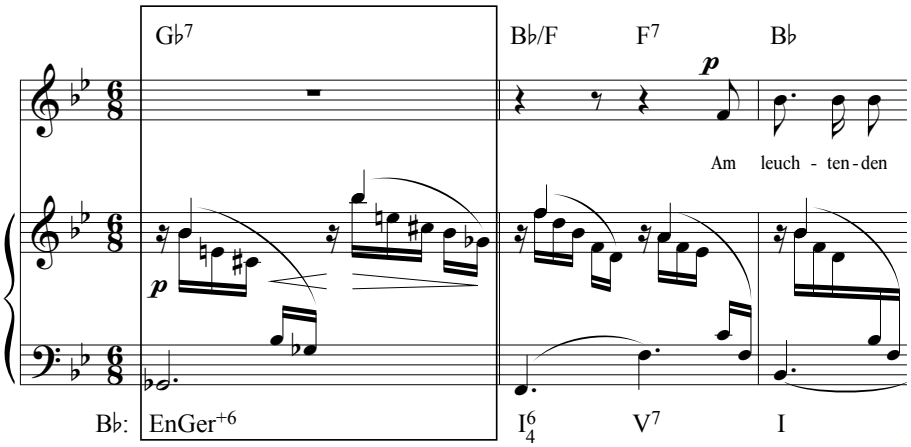


Figure 21.5.9 Robert Schumann, Dichterliebe, Op. 48, "Am leuchtenden Sommermorgen" (1840)

21.6 Distingushing Between Chromatic Harmonies

The following table provides a brief synopsis of what to look for when analyzing chromatic harmonies.

Table 21.6.1 Distingushing Between Chromatic Harmonies

Chromatic Chord Type	What to look for	Chord Labels
Secondary Dominant	QUALITY—M triad or Mm7	V/__, V7/__
Secondary Diminished	QUALITY—°, °7, ø7	vii°/__, vii^{ø7}/__, vii$^{°7}$/__
Mode Mixture	ACCIDENTALS—lowered notes	ii°, ii^{ø7}, iv, vii$^{°7}$, ♭VI, etc.
Neapolitan	♭II	N
Augmented Sixth Chord	°3 interval	It^{+6}, Fr^{+6}, Ger^{+6}, EnGer^{+6}

21.7 Descending Chromatic Bass Lines

A common musical pattern is the descending chromatic bass line (1̂–7̂–♭7̂–6̂–♭6̂–5̂). Composers harmonize descending chromatic bass lines with all manner of harmonies, including secondary chords, borrowed chords, augmented sixth chords, and rarely-used diatonic chords. Below are some examples from the past four centuries.

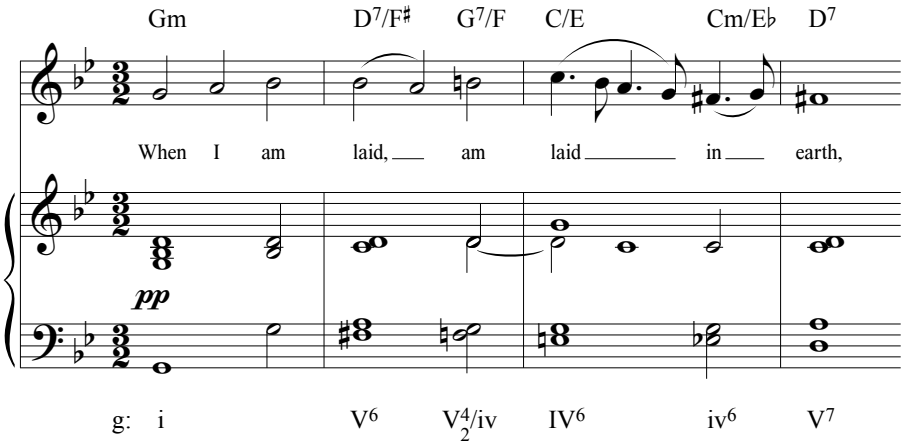


Figure 21.7.1 Henry Purcell, *Dido and Aeneas*, Z. 636, "When I am laid in earth" (Dido's Lament) (1688)

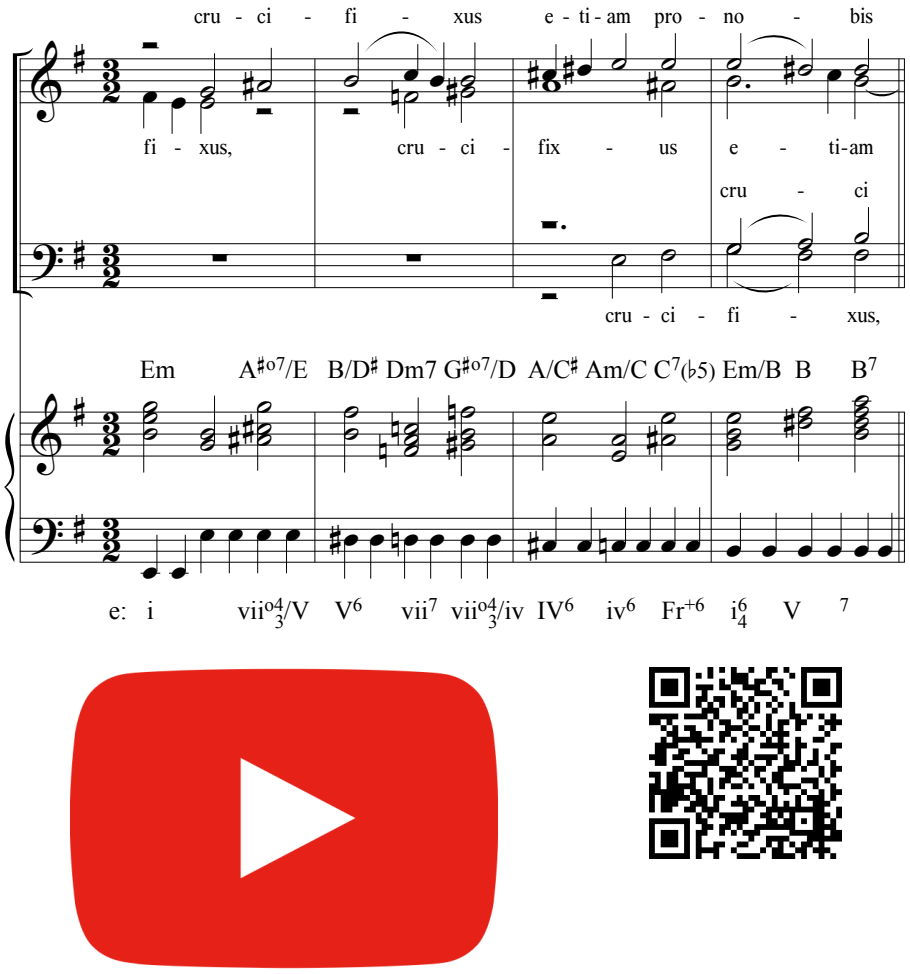


Figure 21.7.2 J.S. Bach, *Mass in B minor*, BWV 232, Crucifixus (1733)

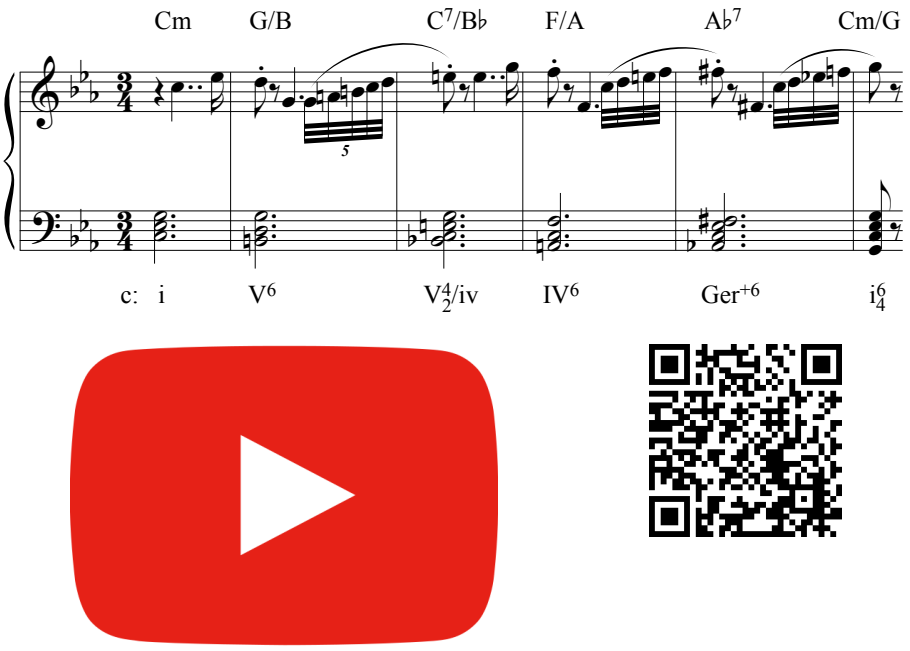


Figure 21.7.3 Beethoven, 32 Variations in C minor, WoO 80 (1806)

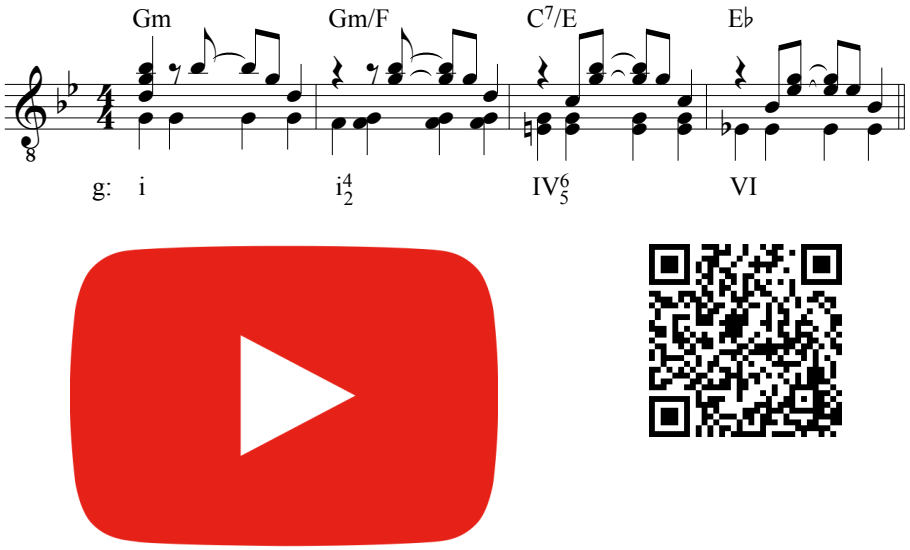


Figure 21.7.4 George Harrison, "While My Guitar Gently Weeps" (1968)

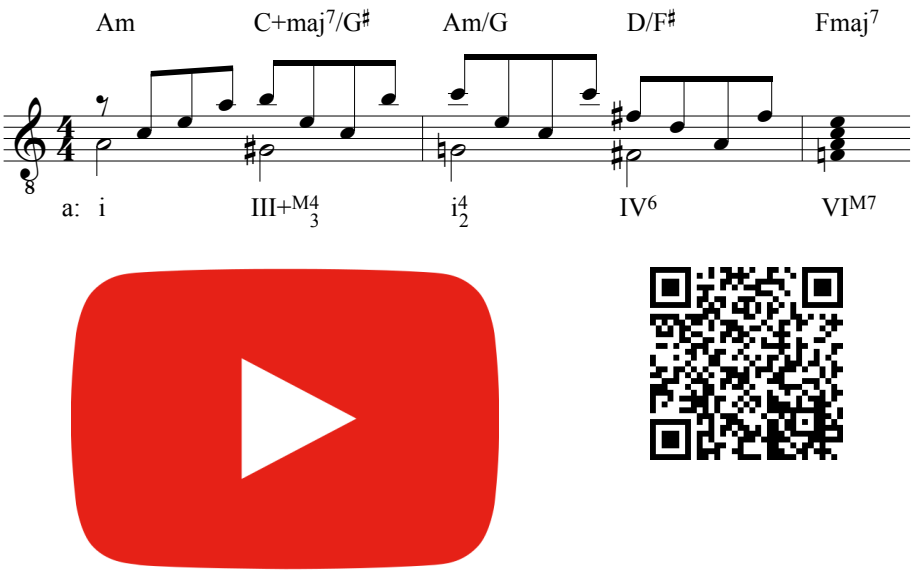


Figure 21.7.5 Jimmy Page and Robert Plant, "Stairway to Heaven" (1971)

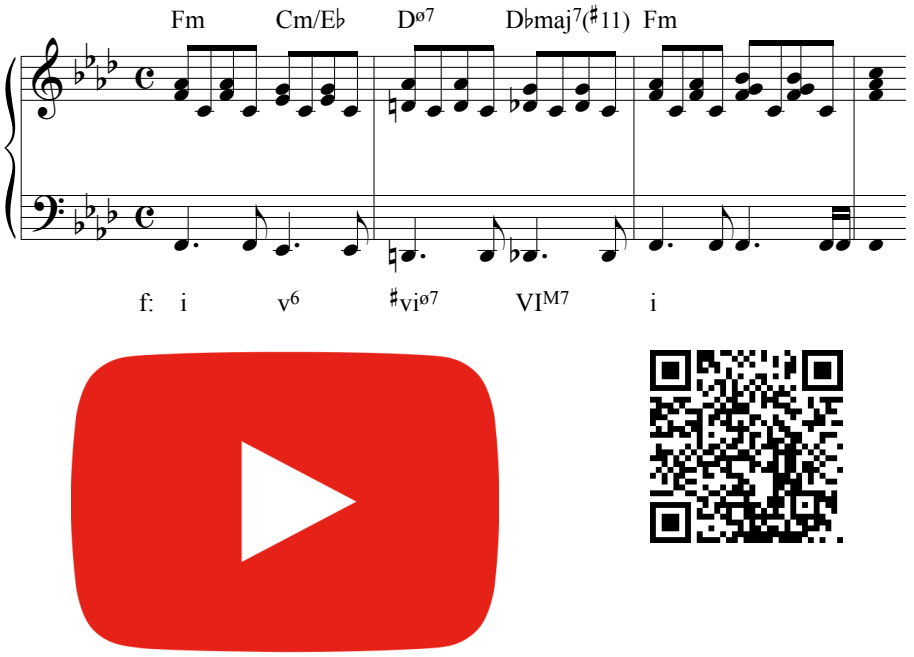


Figure 21.7.6 Steven Tyler, "Dream On" (1973)

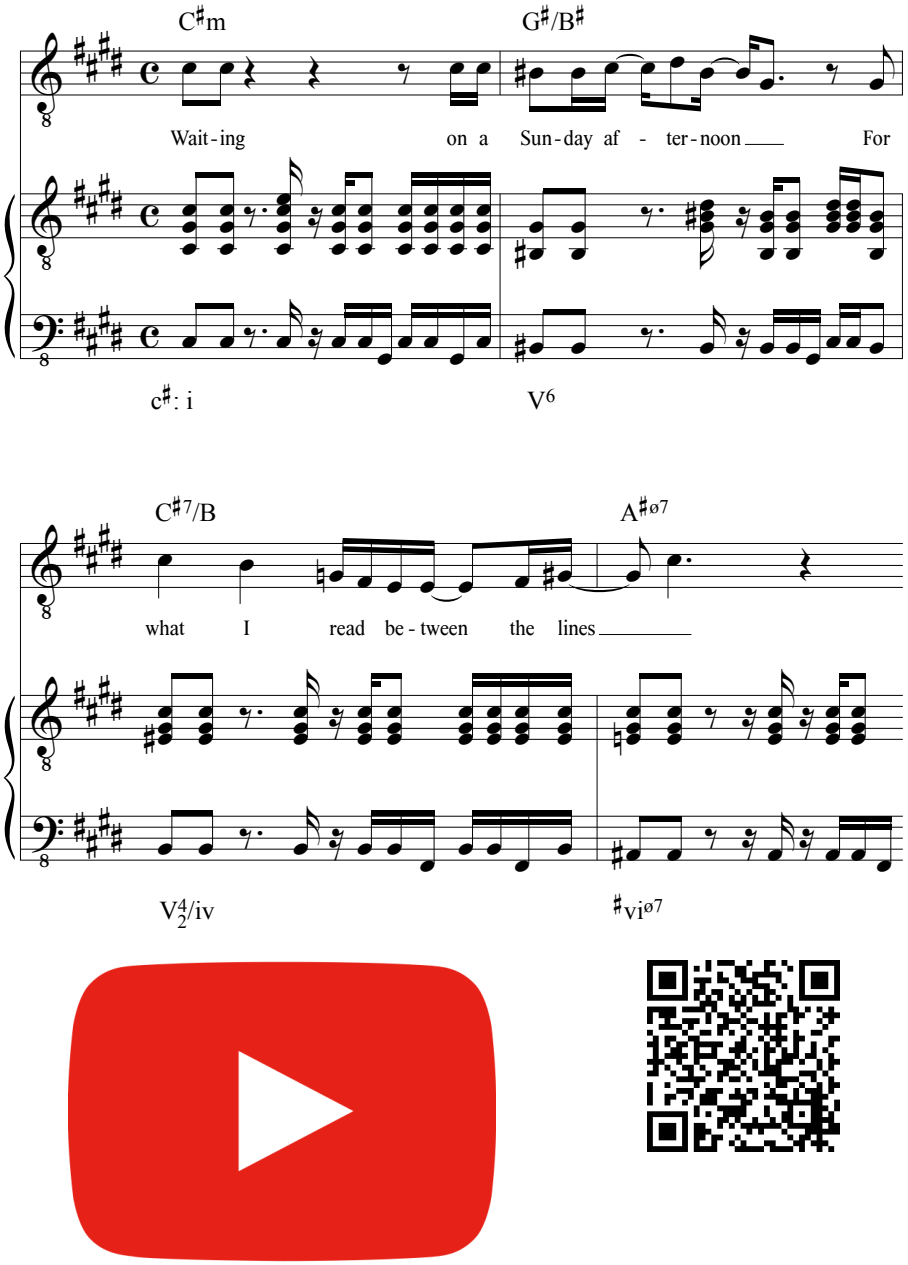


Figure 21.7.7 Robert DeLeo and Scott Weiland, “Interstate Love Song” (1994)

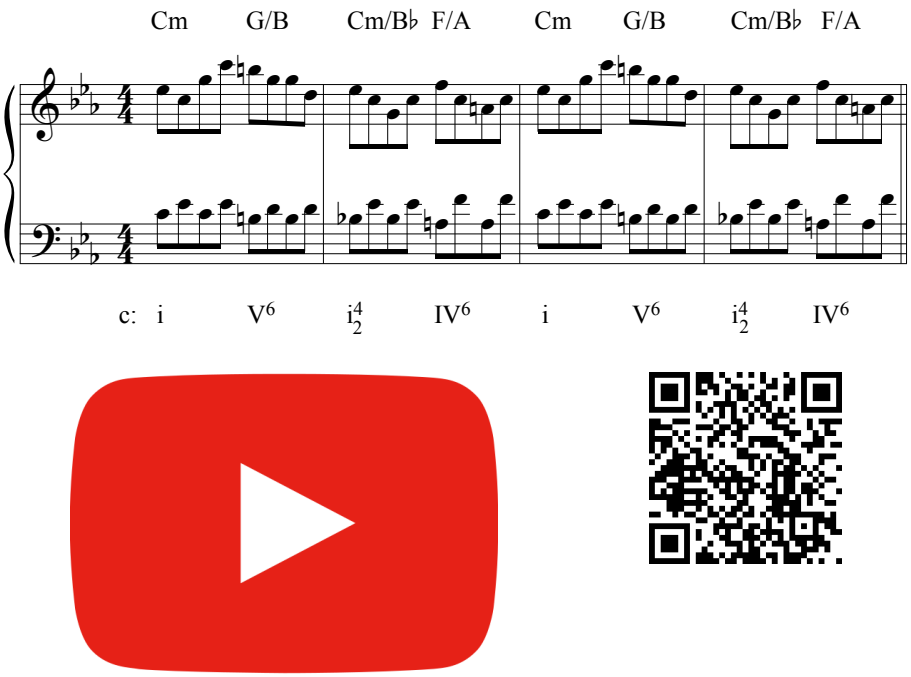


Figure 21.7.8 Christina Perri, "Jar of Hearts" (2010)

Below is a table comparing the harmonizations of these descending bass lines.

Table 21.7.9

Bass Line	$\hat{1}$	$\hat{7}$	$\flat\hat{7}$	$\hat{6}$	$\flat\hat{6}$	$\hat{5}$
Purcell	i	V^6	V^4_2/iv	IV^6	iv^6	V
Bach	$i-vii^{\circ 4}_3/V$	V^6	$vii^7-vii^{\circ 4}_3/iv$	IV^6	iv^6-Fr^{+6}	$i^6_4-V^6$
Beethoven	i	V^6	V^4_2/iv	IV^6	Ger^{+6}	i^6_4
Beatles	i		i^4_2	IV^6_5	VI	
Led Zeppellin	i	$III^{+M\ 4}_3$	i^4_2	IV^6	VI^{M7}	
Aerosmith	i		i^4_2	$\sharp vi^{\circ 7}$	VI^{M7}	
S.T.P.	i	V^6	V^4_2/iv	$\sharp vi^{\circ 7}$	(VI)	
Perri	i	V^6	i^4_2	IV^6		

For the harmonization of scale degree $\hat{6}$, remember that the concept of $\sharp vi^\circ$ was introduced when Roman numerals in minor were introduced. The notes of the $\sharp vi^{\circ 7}$ chord belong to the *melodic* minor scale.

21.8 Chromatic Pre-Dominant Chords

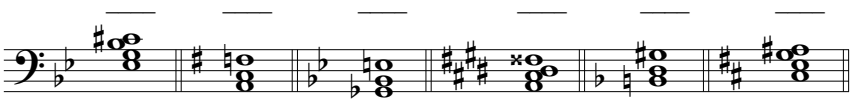
The table below shows how our study of chromatic harmonies in recent chapters includes the chromatic expansion of the pre-dominant harmonic function category.

Table 21.8.1

Ton.	Ton. Prol.	Pre-Dom.	Dom.	Ton.
I	iii	IV	vii°	I
	vi	ii	V	
		V/V		
		vii°/V		
		iv		
		$ii^{ø7}$		
		N^6		
		It^{+6}, Fr^{+6}, Ger^{+6}		

21.9 Practice Exercises

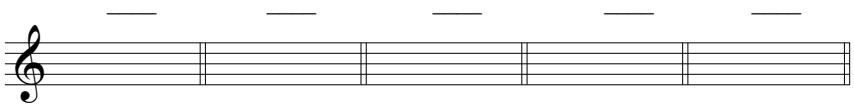
1. Analyze the following chords with lead-sheet symbols above and Roman numerals with figured bass inversion symbols below.



g: ____ e: ____ B♭: ____ c♯: ____ d: ____ b: ____

1 2 3 4 5 6

2. Given the Roman numeral, please write the notes of the chord and lead-sheet symbol. Include key signatures.



1. c♯: Fr^{+6} 2. F: It^{+6} 3. G: $EnGer^{+6}$ 4. a: vii^{o6}_{5}/V 5. d: Ger^{+6}

Click here to download the first homework assignment for this chapter.
Click here to download the second homework assignment for this chapter.
Click here to download the Unit 4 Practice Test.

Chapter 22

Modulation

22.1 Modulation

At its simplest, **modulation** is a change of key that happens within a composition. In popular music, the change of key will often be called a "**key change**" instead of a "modulation." Those who study classical music theory typically reserve the term "modulation" for the slower and more subtle change of key that occurs in many classical pieces, although there are similarities between "key change" in popular music and the classical music term "direct modulation," which we will study later in this chapter.

Here are examples of key changes in popular music.

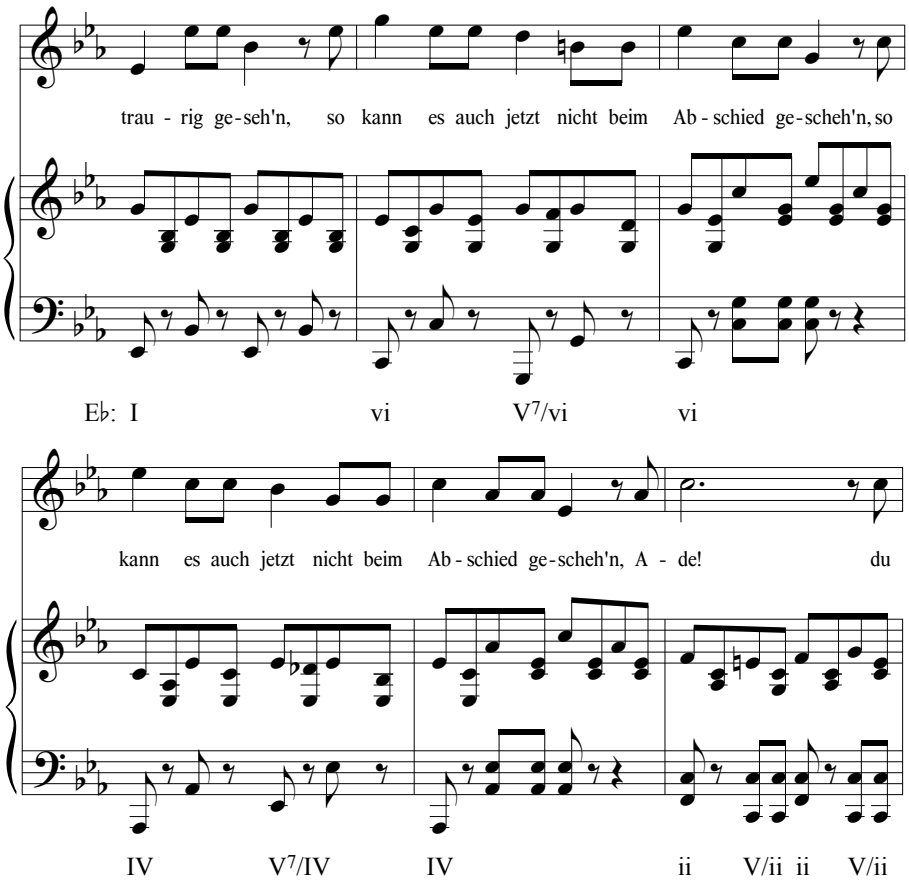
Figure 22.1.1 Beyoncé Knowles, Terius Nash, and Shea Taylor, "Love on Top" (2011)

Figure 22.1.2 James Horner and Will Jennings, "My Heart Will Go On" (1997)

Figure 22.1.3 Jon Bon Jovi, Richie Sambora, and Desmond Child, "Livin' on a Prayer" (1986)

22.2 Tonicization versus Modulation

Studying modulation will require us to distinguish between tonicization, which we studied recently, and modulation. Tonicization, involving secondary chords, can be as short as two chords (V/V to V, for example) but can sometimes encompass several measures as in the following example.



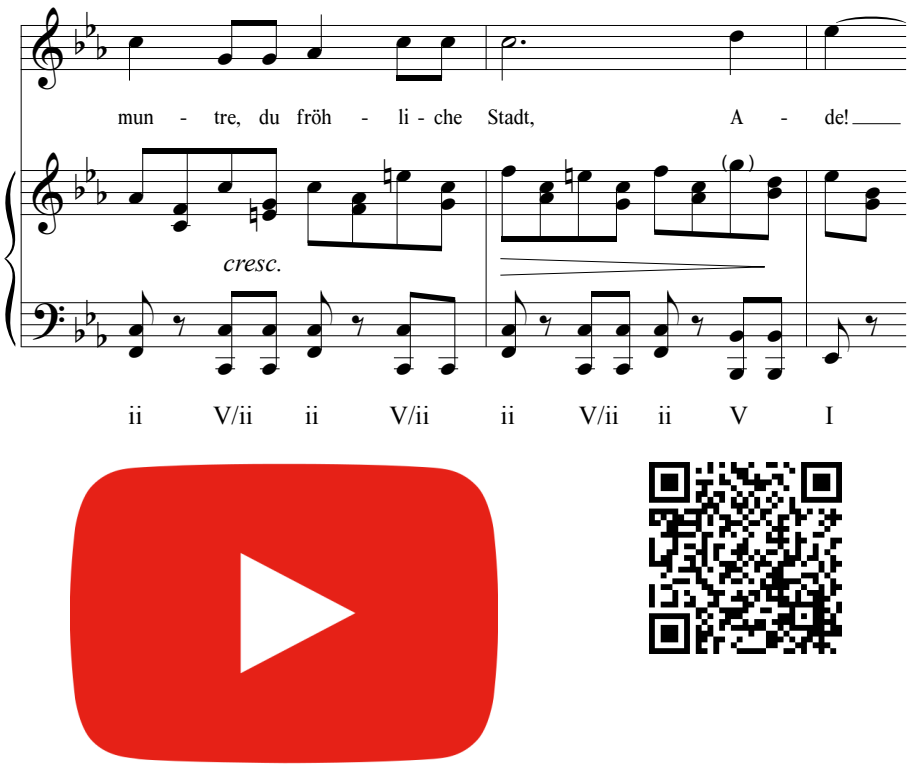


Figure 22.2.1 Schubert, *Schwanengesang*, D. 957, "Abschied" (1828)

Below is a reduction showing the underlying diatonic progression of the example above.

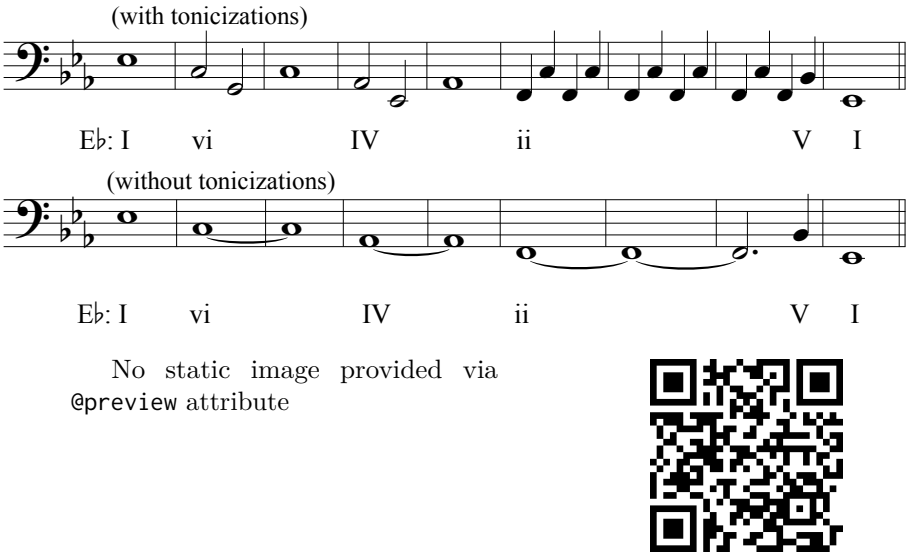


Figure 22.2.2 Reduction of Harmonies from "Abschied"

A modulation to a new key requires an eventual cadence to confirm that new key. This cadence will often (though not always) have the following cadential formula:

Table 22.2.3 Cadential Formula to Establish a Key

ii^6	I^6_4	V	I
Pre-Dom.	Dom.	Dom.	Ton.

No static image provided via `@preview` attribute

Figure 22.2.4 Audio Realization of Cadential Formula to Establish a Key

In his book *Form in Tonal Music*, Douglass Green defines a V–I authentic cadence with a pre-dominant prefix as a "full cadence."

The cadential formula above is found in the following example.

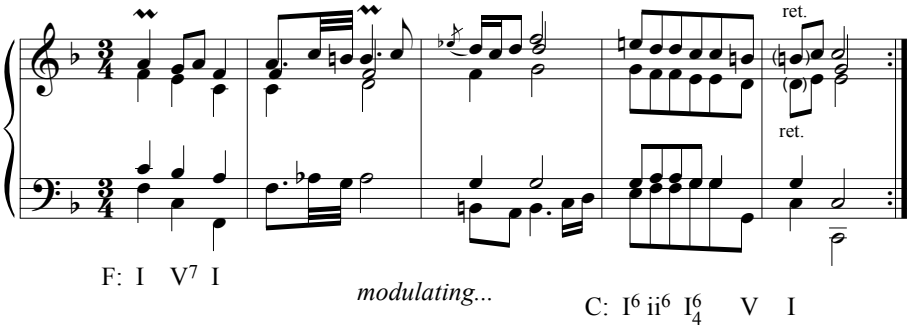


Figure 22.2.5 J.S. Bach, English Suite No. 4 in F Major, BWV 809, Sarabande (ca. 1715)

Notice that this cadential formula establishes a key more strongly than the simple V–I of an authentic cadence. This means there will be ambiguity between a tonicization and a short modulation ending in an authentic cadence, especially in music with fast harmonic rhythm, like Bach chorales (usually in quarter-note harmonic rhythm).

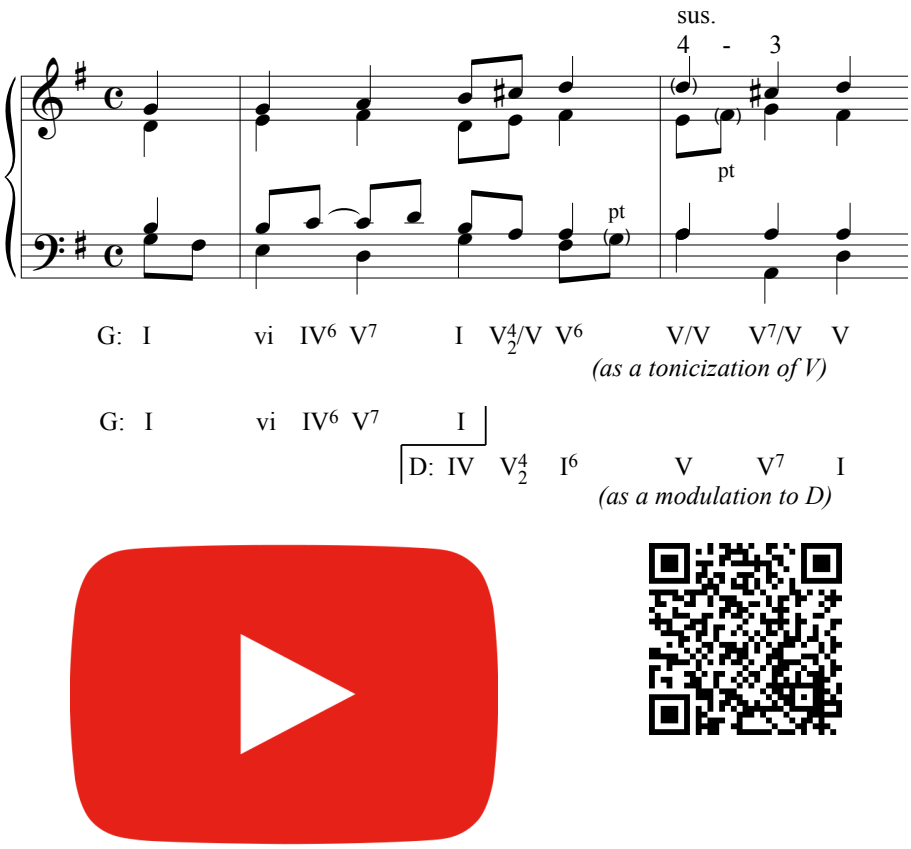


Figure 22.2.6 J.S. Bach, *Christmas Oratorio*, BWV 248, "Ermuntre dich, mein schwacher Geist," (Chorale) (1734)

To determine pivot chords and the new key, listen to the music to hear the cadence in the new key, then work backward from the cadence to see if the dominant in the new key was approached by pre-dominant chords (ii or IV) in the new key. Then, analyze from the beginning of the phrase until you reach the new key. Finally, look for a logical pivot point. Sometimes two successive chords could logically be pivot chords. If so, include two chords on either side of your pivot bracket.

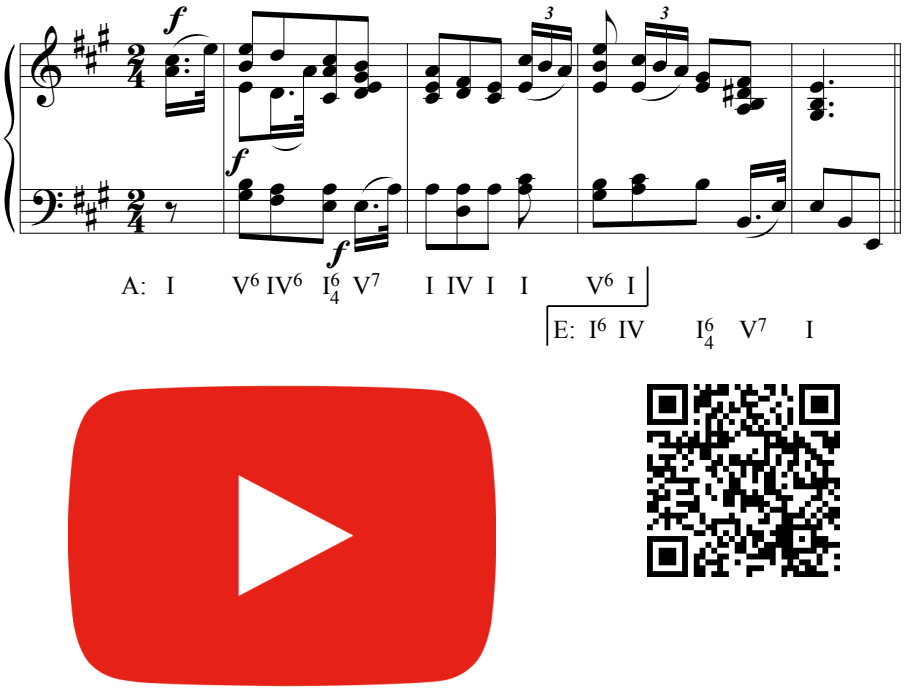


Figure 22.2.7 Robert Schumann, Album for the Young, Op. 68, No. 17, "Little Morning Wanderer" (1848)

Before we start analyzing and writing modulations, we will examine key relationships and pivot chords.

22.3 Key Relationships

In the Baroque and Classical eras, composers typically modulated to the dominant (when starting in a major key) or to the relative major (when starting in a minor key). In the Romantic era, composers experimented with modulating to more remote (or perhaps adventurous) key areas, described as "foreign" to the home key.

"**Closely related**" keys have key signatures one degree "sharper" or "flatter" than the starting key. For any major or minor key, there are five closely related keys, including the relative major or minor of the home key.

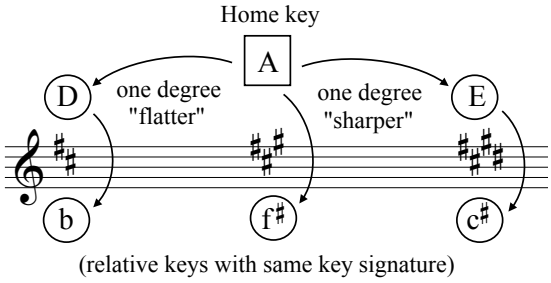


Figure 22.3.1 Closely Related Keys with A Major as Home Key

Key signatures that are not closely related are said to be "**foreign**" or "**distantly related**." We will see that some types of modulations from the Romantic era, like common-tone modulations, exploit foreign key relationships

to dramatic effect.

22.4 Modulations with Diatonic Pivot Chords

Modulations with pivot chords will be analyzed using a pivot bracket, as we've seen earlier in the chapter.

In a **diatonic common chord modulation**, the pivot chords will be diatonic in both keys.

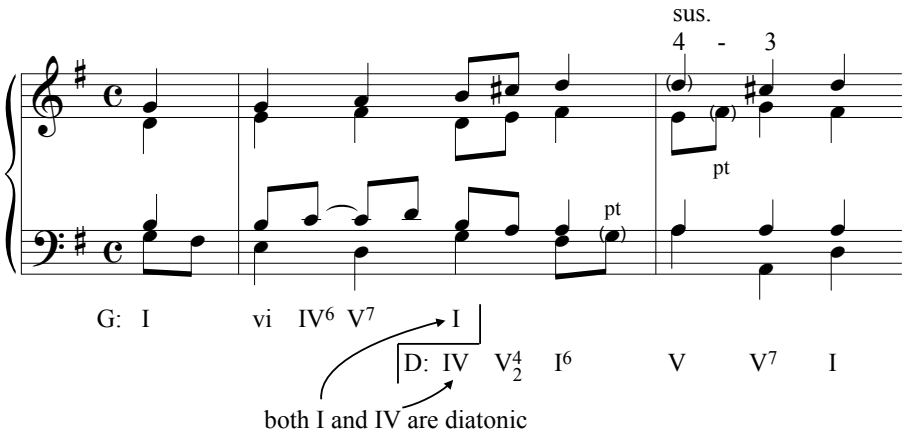


Figure 22.4.1 J.S. Bach, *Christmas Oratorio*, BWV 248, "Ermuntre dich, mein schwacher Geist," (Chorale) (1734)

22.4.1 Determining Common Chords Between Keys

In order to compose a diatonic common chord modulation, you need to determine which chords are diatonic—having the same root *and quality*—in both keys.

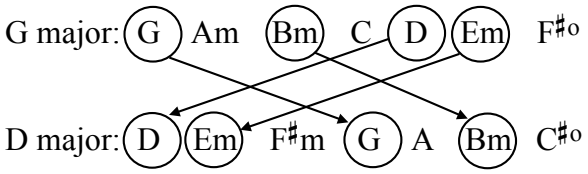


Figure 22.4.2 Diatonic Common Chords in G major and D major

We can repeat this process with Roman numerals, aligning the roots of the chords in the two keys.

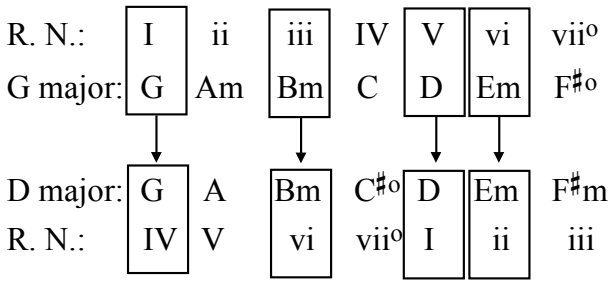


Figure 22.4.3 Roman Numerals for Diatonic Common Chords in G major and D major

If you are a composer wanting to write a diatonic common chord modulation, you need to determine the best place within a progression to pivot to the new key. To do this, you need to consider the harmonic function of the pivot chords.

22.4.2 Harmonic Functions of Diatonic Pivot Chords

In terms of harmonic function, composers typically do not use a pivot chord that has dominant function in the new key because such a modulation might sound abrupt and unconvincing. Instead, the pivot chord in the first key often has tonic or tonic prolongation function.

In the following example, the pivot chord simultaneously has tonic function in the first key and pre-dominant function in the second key. This creates a more seamless and less jarring progression to the second key.

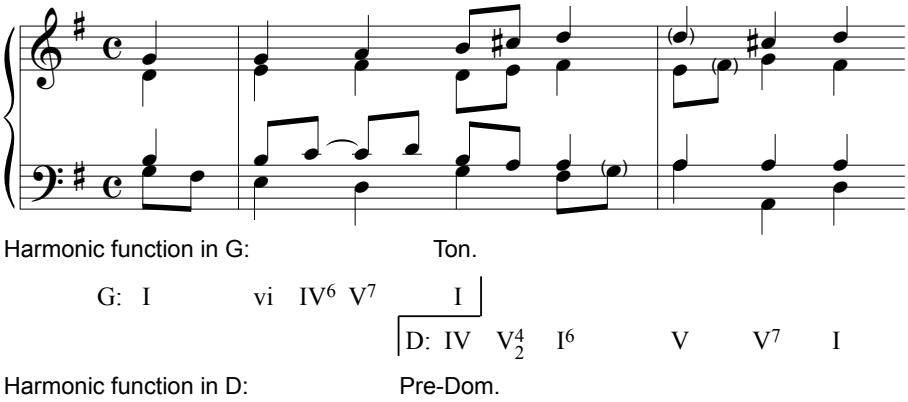


Figure 22.4.4 J.S. Bach, *Christmas Oratorio*, BWV 248, "Ermuntre dich, mein schwacher Geist," (Chorale) (1734)

The pivot chord in the first key, G, has tonic harmonic function, while in

the second key, D major, the G chord has pre-dominant function.

Observe the harmonic function of the pivot chords in the following examples from Bach chorales.

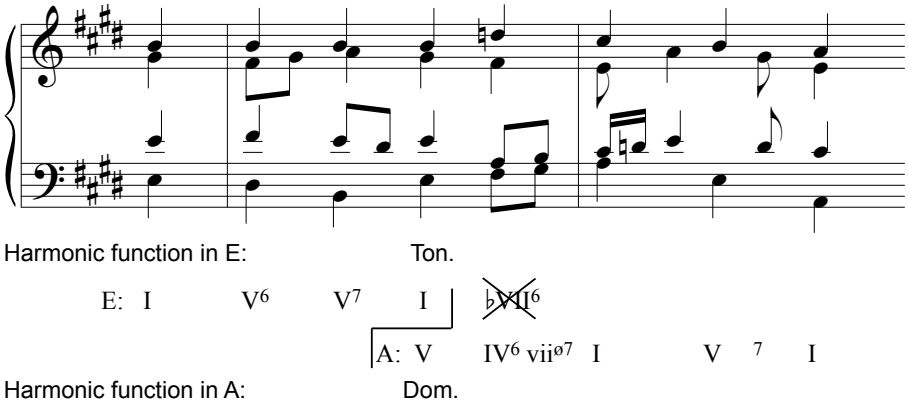


Figure 22.4.5 J.S. Bach, Chorale 4, "Es ist das Heil uns kommen her", BWV 9

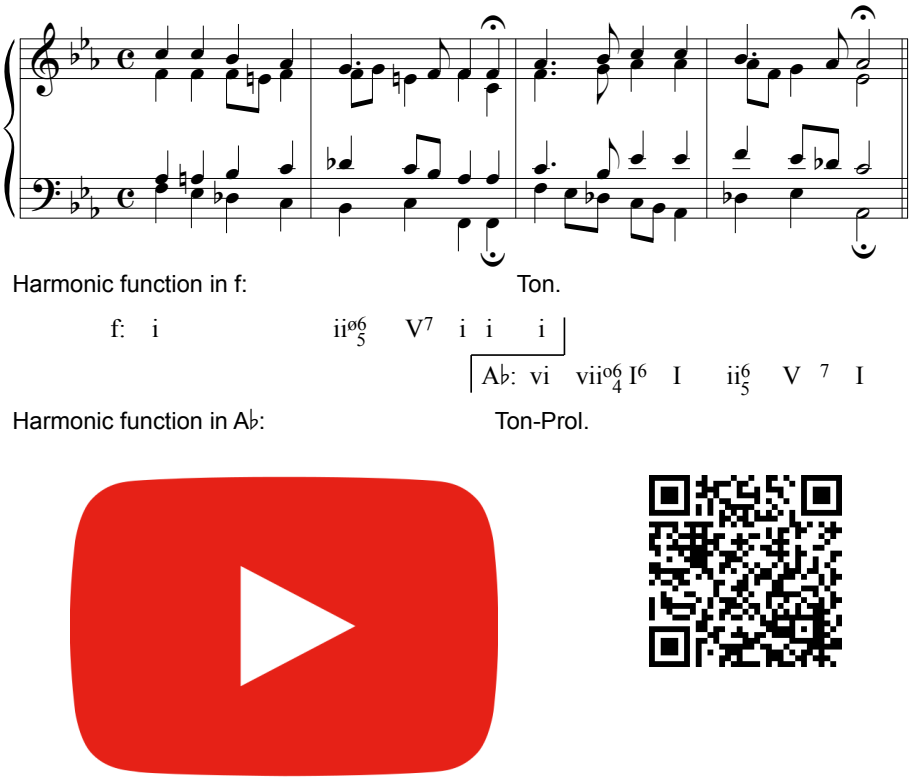


Figure 22.4.6 J.S. Bach, Chorale 8, "Freuet euch, ihr Christen", BWV 40

22.5 How to Recognize a Key After a Modulation

Look for the following cues when examining music containing modulations:

1. Look for recurring accidentals, then add them to the key signature to determine the new key
   (a) Lowered notes (like flats) usually create $\hat{4}$ (as do the flats in key signatures)
   (b) Raised notes (like sharps) often create $\hat{7}$, the leading tone
      i. If there are multiple raised notes, look for the "sharpest of sharps" (in key signature order) to determine which sharp is acting as $\hat{7}$
2. If accidentals are canceled out, they indicate tonicizations or chromatic non-chord tones

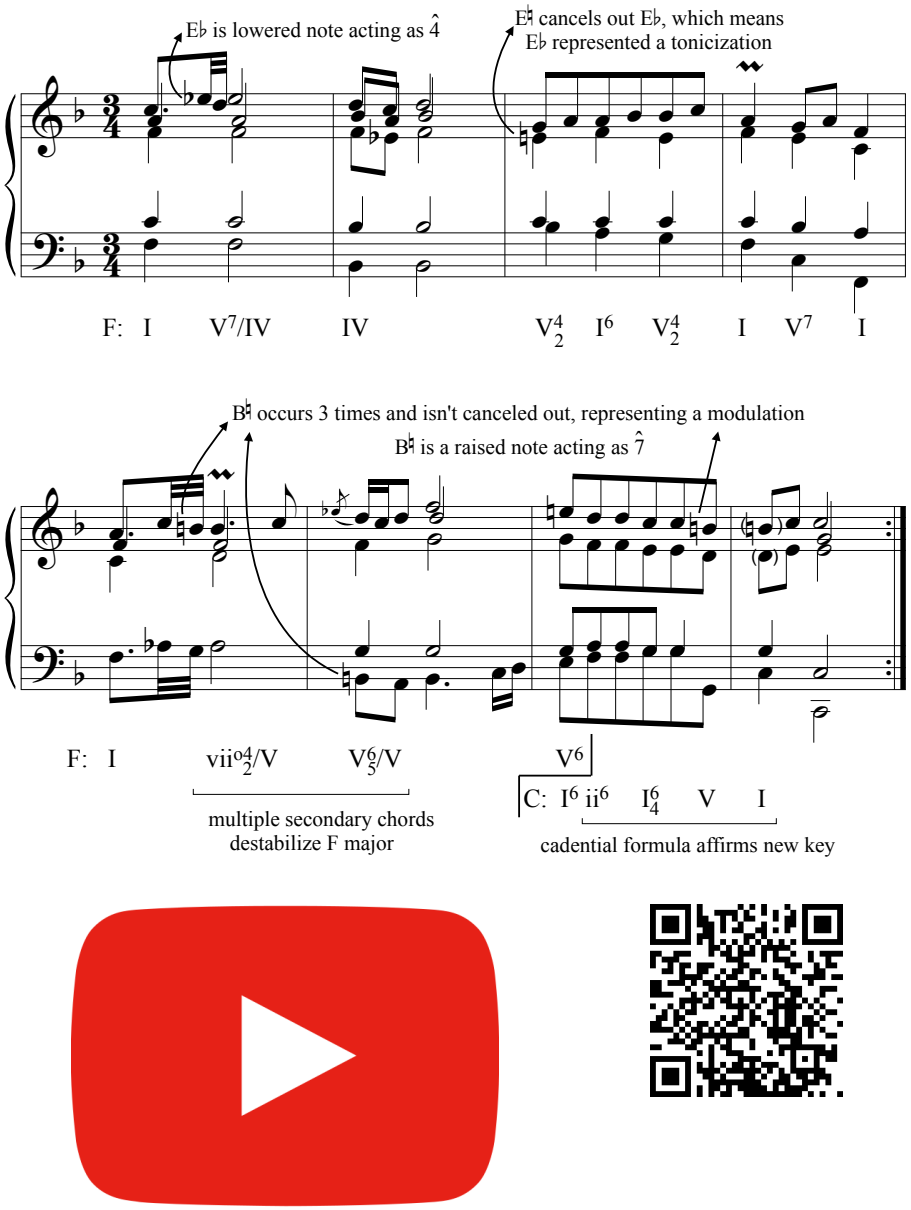


Figure 22.5.1 J.S. Bach, English Suite No. 4 in F Major, BWV 809, Sarabande (ca. 1715)

22.6 Modulations with Chromatic Pivot Chords

You will sometimes encounter examples where the pivot chord is a chromatic chord in at least one (and sometimes both) of the keys involved in the modulation.

22.6.1 Secondary Common Chord

Below is an example where the pivot chord is a secondary chord in both keys.

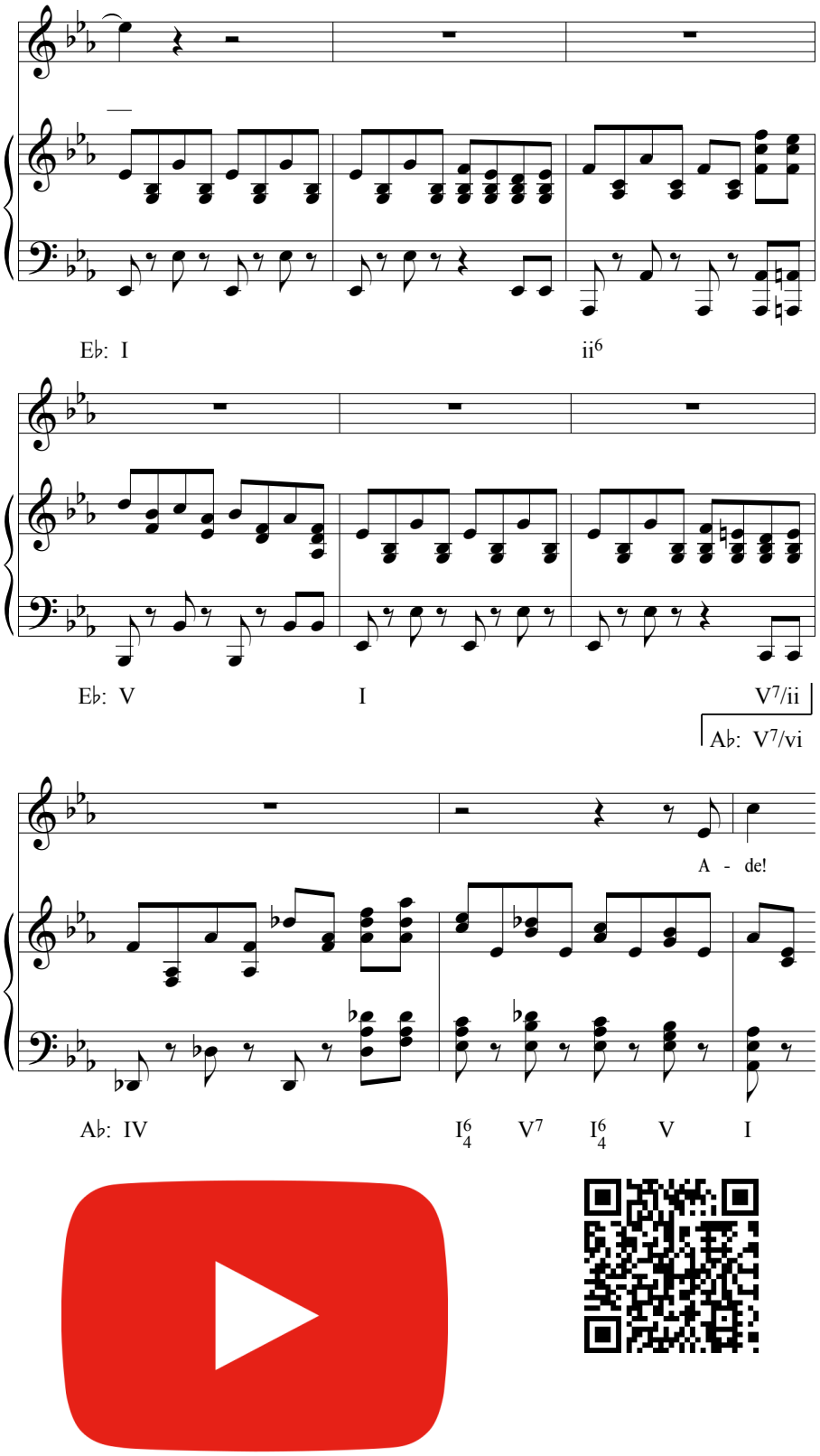


Figure 22.6.1 Schubert, *Schwanegesang*, D. 957, "Abschied" (1828)

22.6.2 Borrowed Common Chord

In modulation by **borrowed common chord** (or mode mixture), the pivot chord will be a borrowed chord in one of the keys involved in the modulation.

In the following example, a borrowed chord, i^6 in D♭ major, rewritten as a C♯ minor chord, is reinterpreted as vi^6 in the second key, E major.

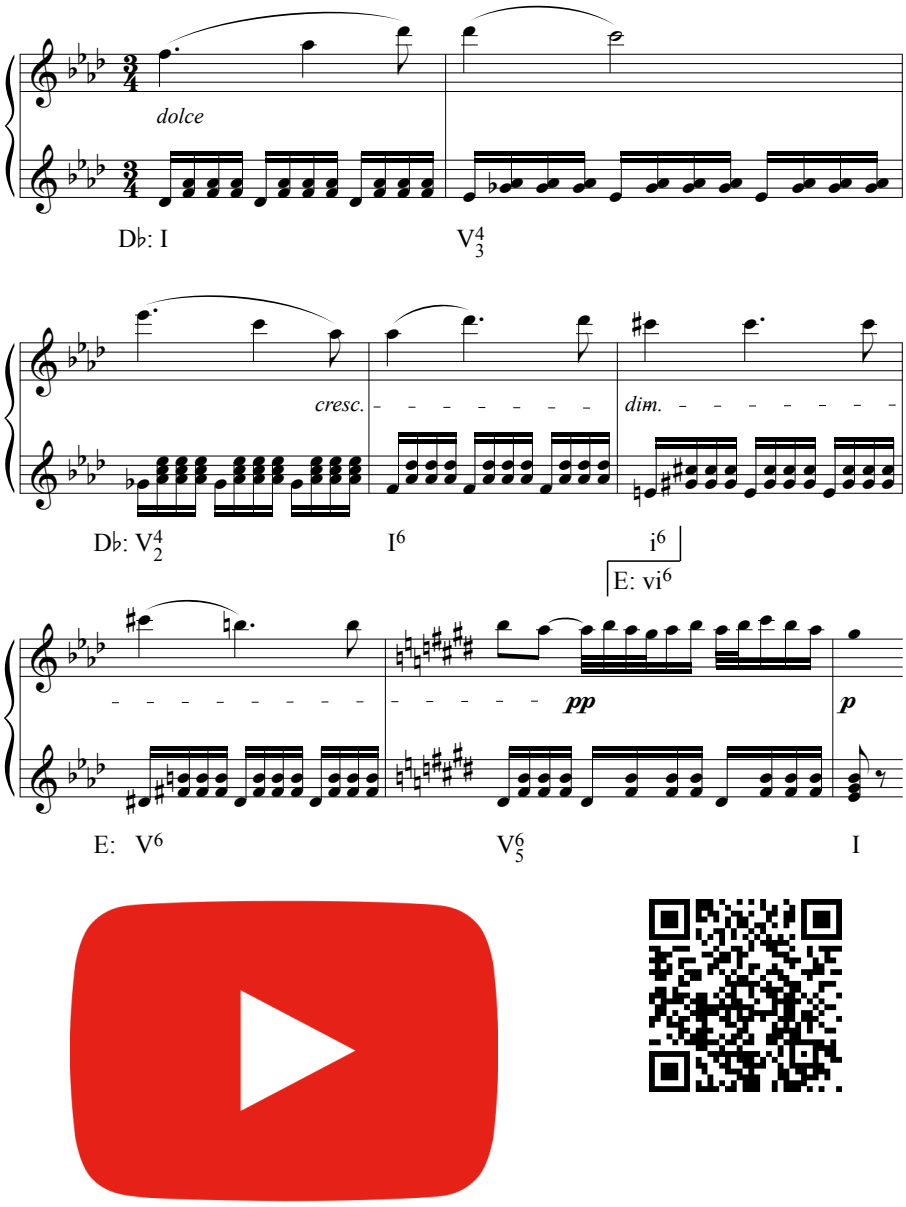


Figure 22.6.2 Beethoven, Piano Sonata No. 31 in A♭ major, Op.110, I, (1821)

22.6.3 Neapolitan Common Chord

A particularly adventurous and imaginative pivot is the Neapolitan, which can bridge the gap between two foreign (or distantly related) keys.

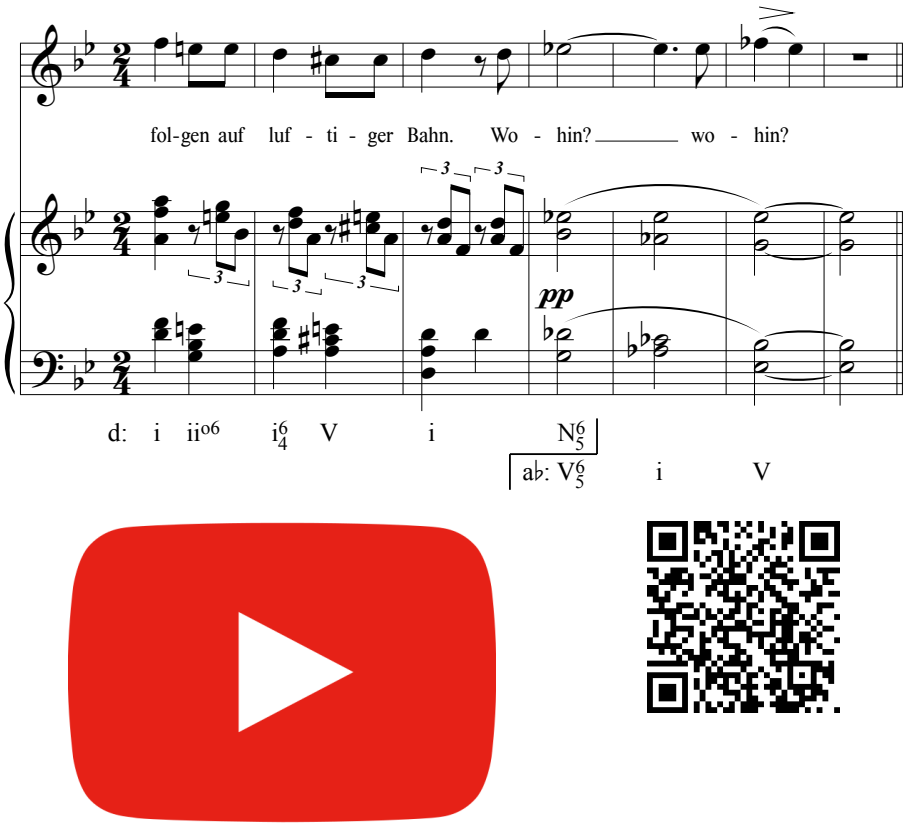


Figure 22.6.3 Schubert, *Schwanegesang*, D. 957, "Frühlingssehnsucht" (1828)

In the example above, Schubert bridges the tonal distance between D minor and A♭ minor with N^6_5 (note the dominant-seventh quality of the Neapolitan in this instance), which acts as a V^6_5 in A♭ minor, a tritone away from D minor.

22.6.4 Augmented Sixth Common Chord

In the next chapter, we will examine how Augmented Sixth chords are enharmonically reinterpreted in a process known as enharmonic modulation.

22.7 Modulations Without Pivot Chords

This section contains the following subsections below:

- Direct Modulation
- Common-Tone Modulation
- Sequential Modulation

22.7.1 Direct Modulation

Direct modulation (also known as phrase modulation) is a type of modulation where a composer decides to move suddenly to a new key without using pivot chords or preparing the new tonic with its dominant.

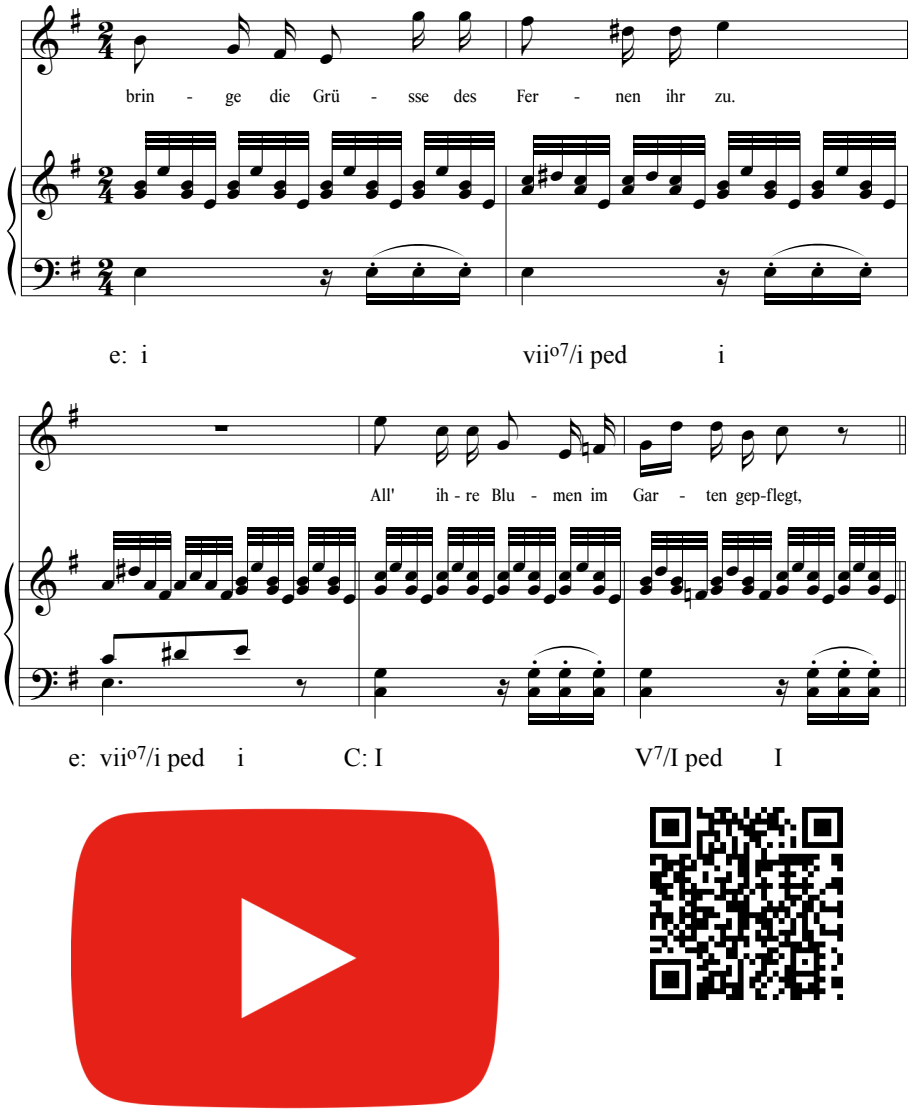


Figure 22.7.1 Schubert, *Schwanegesang*, D. 957, "Liebesbotschaft" (1828)

In the example below from the second song of the same song cycle as the example above, Schubert does not attempt to change gradually from C minor to A♭ major, but instead stops on a half cadence in C minor and begins on the tonic in A♭ major in the next bar.

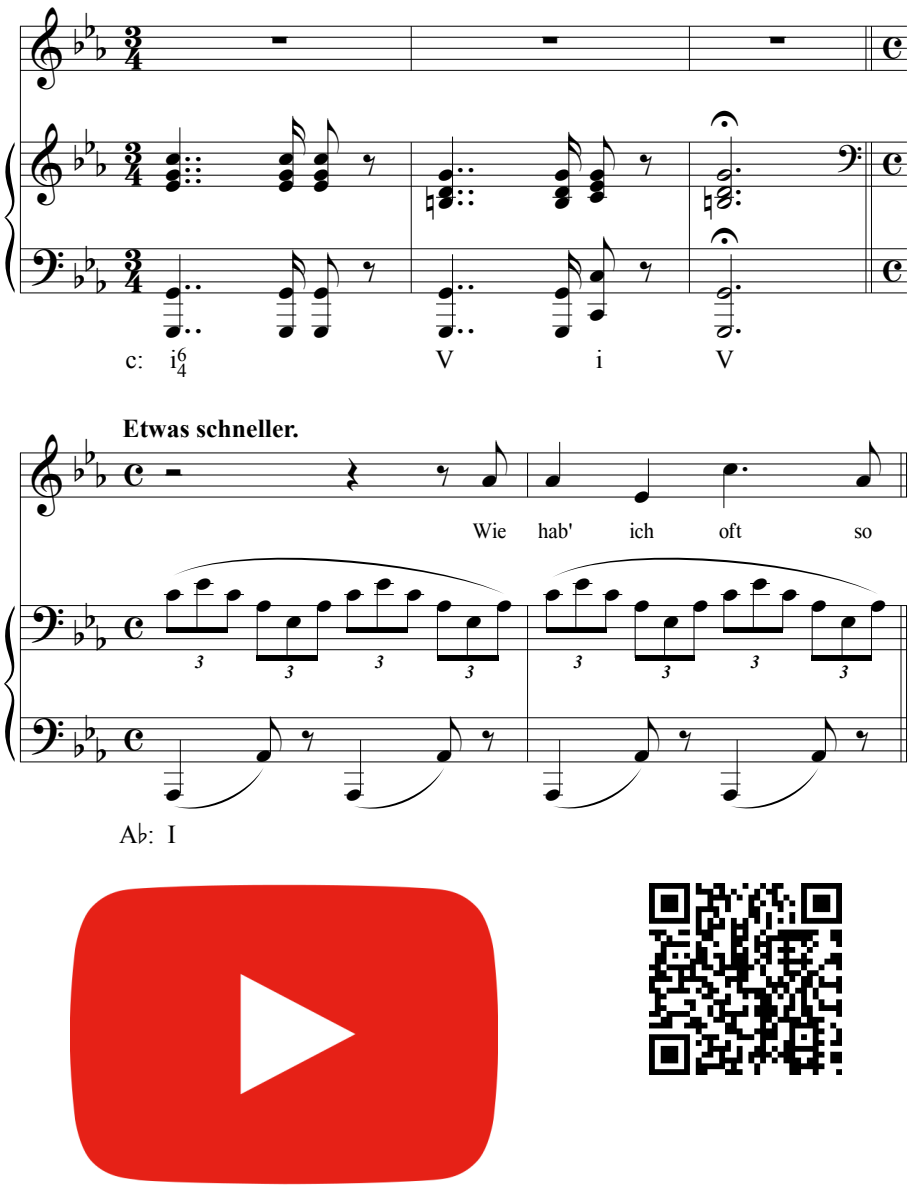


Figure 22.7.2 Schubert, *Schwanegesang*, D. 957, "Kriegers Ahnung" (1828)

Direct modulation is the most common type of "modulation" found in popular music. At the beginning of this chapter we defined this type of modulation in popular music as "key change."

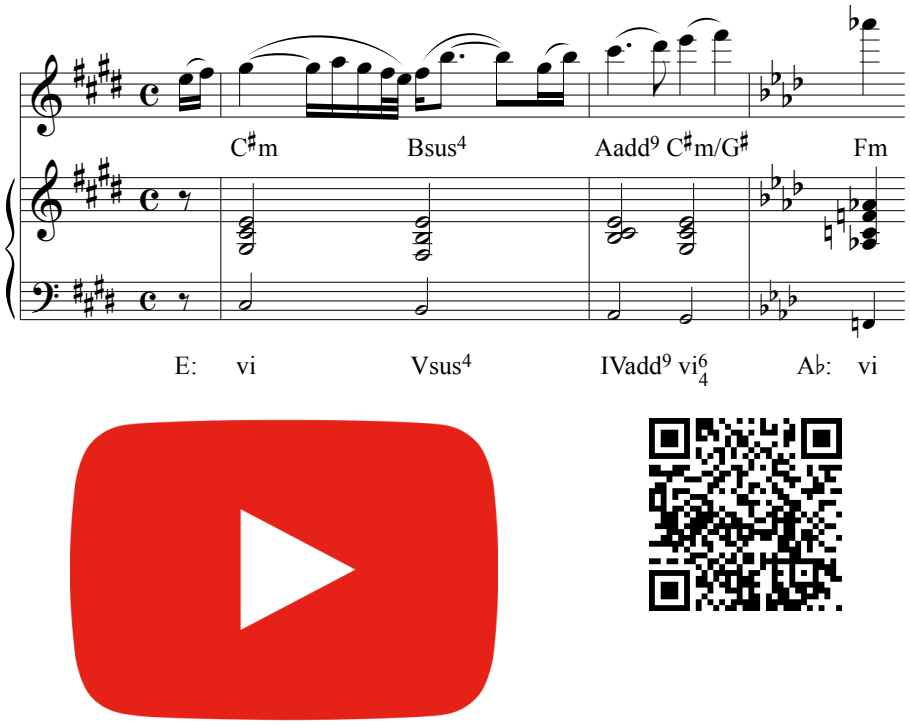


Figure 22.7.3 James Horner and Will Jennings, "My Heart Will Go On" (1997)

With direct modulation, composers do not make any attempt to connect two different keys through any pivot chords or common tones. In the next section, we examine how composers connect two keys through a common tone.

22.7.2 Common-Tone Modulation

In **common-tone modulation**, two chords are connected through a single note to bridge the distance between two keys.

In the following example, the note C♯ acts as a hinge between a C♯ major chord (V in F♯ minor) and an A dominant seventh chord (V^7 in D major).

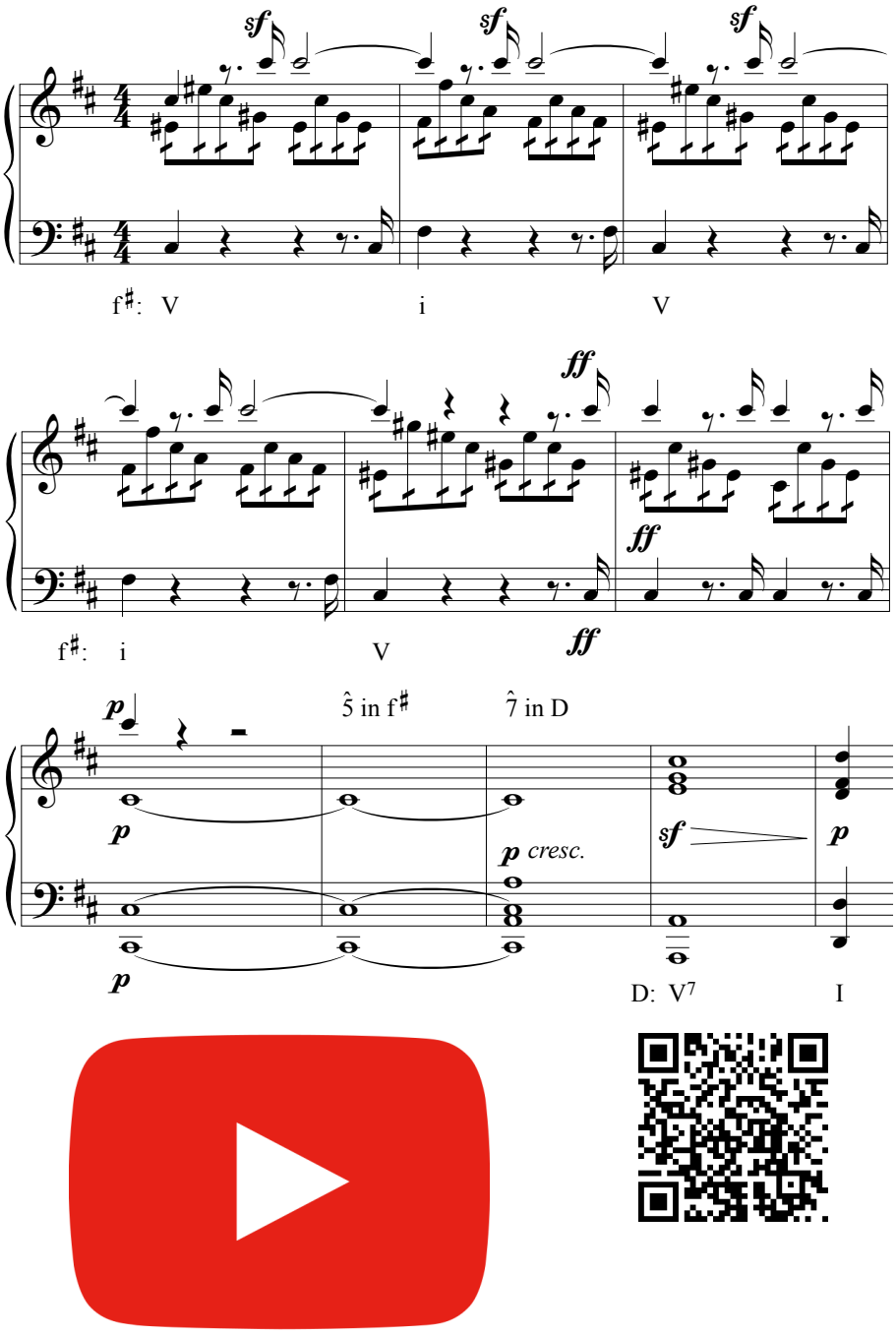


Figure 22.7.4 Beethoven, Symphony No. 2 in D major, Op. 36, I. (1801–1802)

In the next example, the note A acts as a hinge between an A major chord (V in D minor) and an F major chord (I in F major).

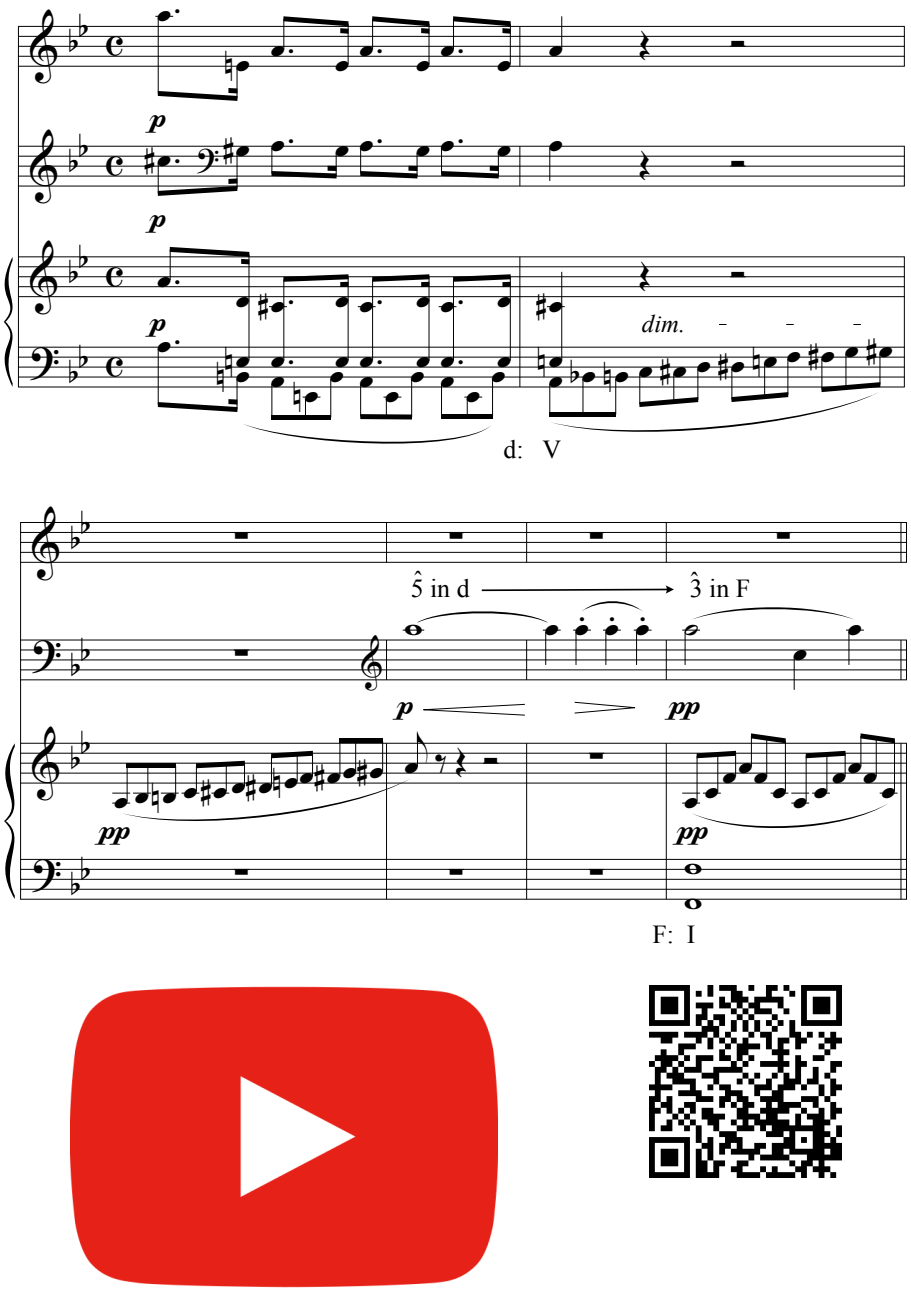


Figure 22.7.5 Schubert, Piano Trio No. 1 in B-flat major, D. 898, I. (1828)

22.7.2.1 Chromatic Mediants

In a common-tone modulation, the two chords connecting the two keys are typically in a chromatic mediant relationship. **Chromatic mediants** are chords with roots a third apart that share only one common tone and have the same quality (both are major or both are minor).

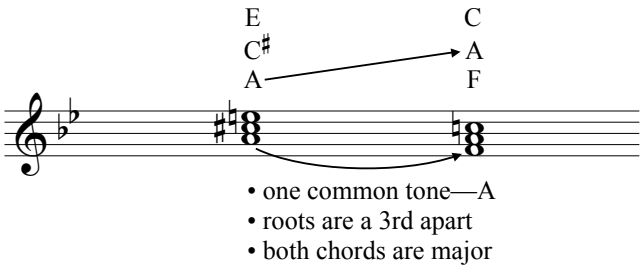


Figure 22.7.6 Chromatic mediant relationship in Figure 22.7.5

Any major or minor triad will have four chromatic mediants, as shown in the example below.

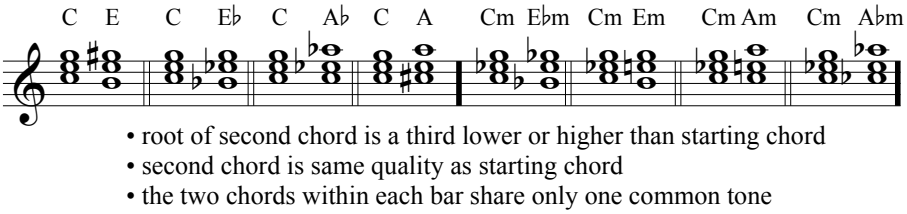


Figure 22.7.7 Chromatic mediants of the C major and C minor triads

Below are examples chromatic mediants that do not involve modulation. In fact, the progression in the following three examples are found in the last bar of Figure 22.7.7, the progression from i to ♭vi (shown as Cm to A♭m in the example above).

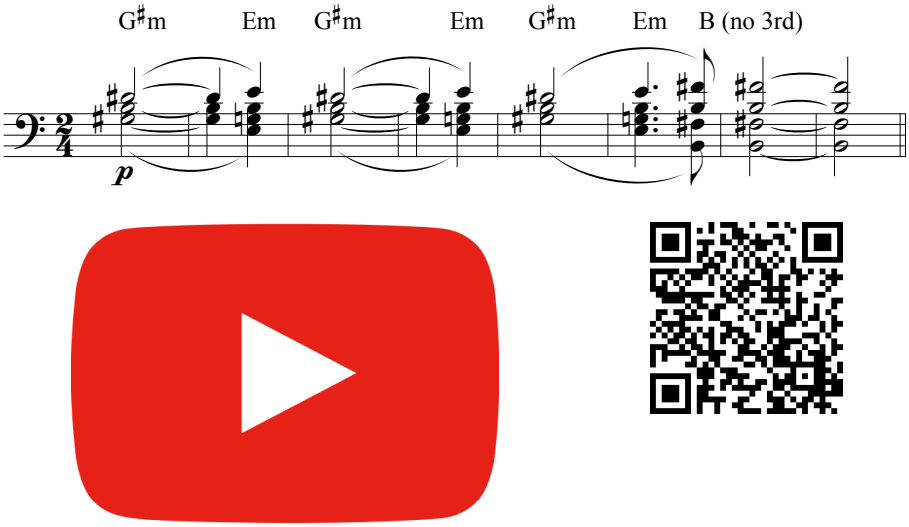


Figure 22.7.8 Richard Wagner, *Das Rheingold*, Scene 3 (1854)

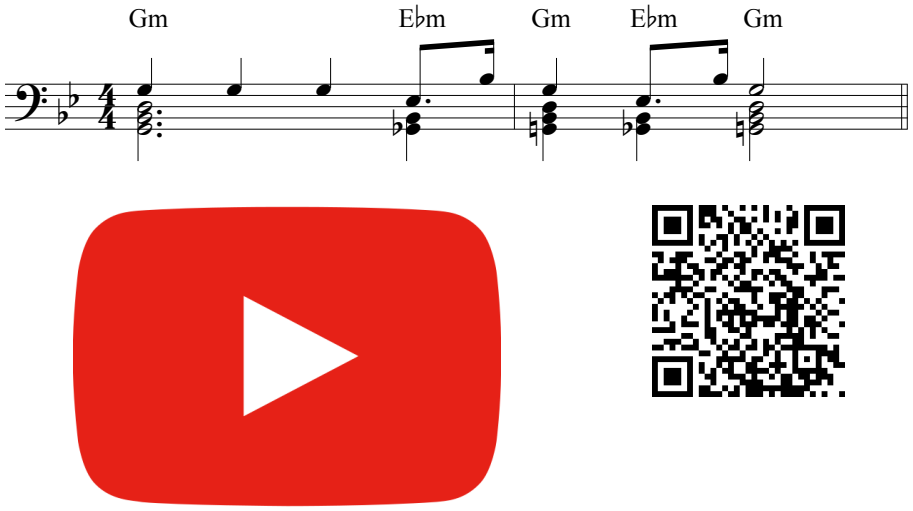


Figure 22.7.9 John Williams, *Star Wars: Return of the Jedi*, "Main Title (The Story Continues)" (1983)

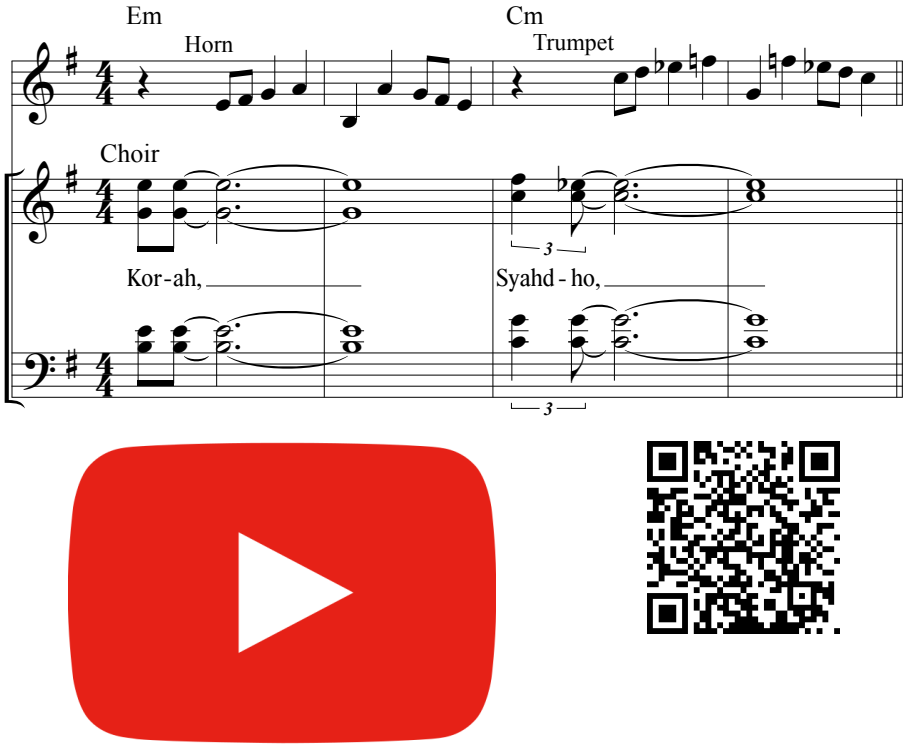


Figure 22.7.10 John Williams, *The Phantom Menace*, "Duel of the Fates" (1999)

22.7.3 Sequential Modulation

Modulation can also be accomplished by sequence. In a **sequential modulation**, a melody and its accompanying harmonies are repeated at a new pitch level to establish or lead to a new key. In the following example, the sequence of the original idea occurs in the new key.

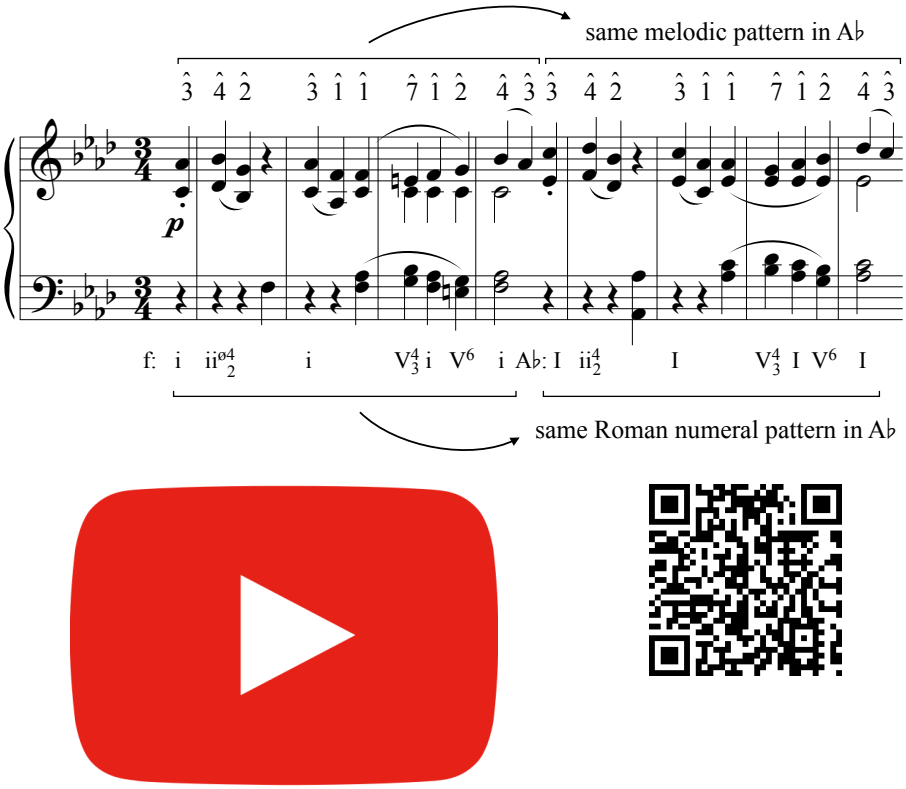


Figure 22.7.11 Beethoven, Piano Sonata Op. 2, No. 1, III. (1795)

In the following example, an idea in C major is repeated up a step in D major, then up another step in E minor before reaching an F♯° chord, a chord with dominant function in G major.

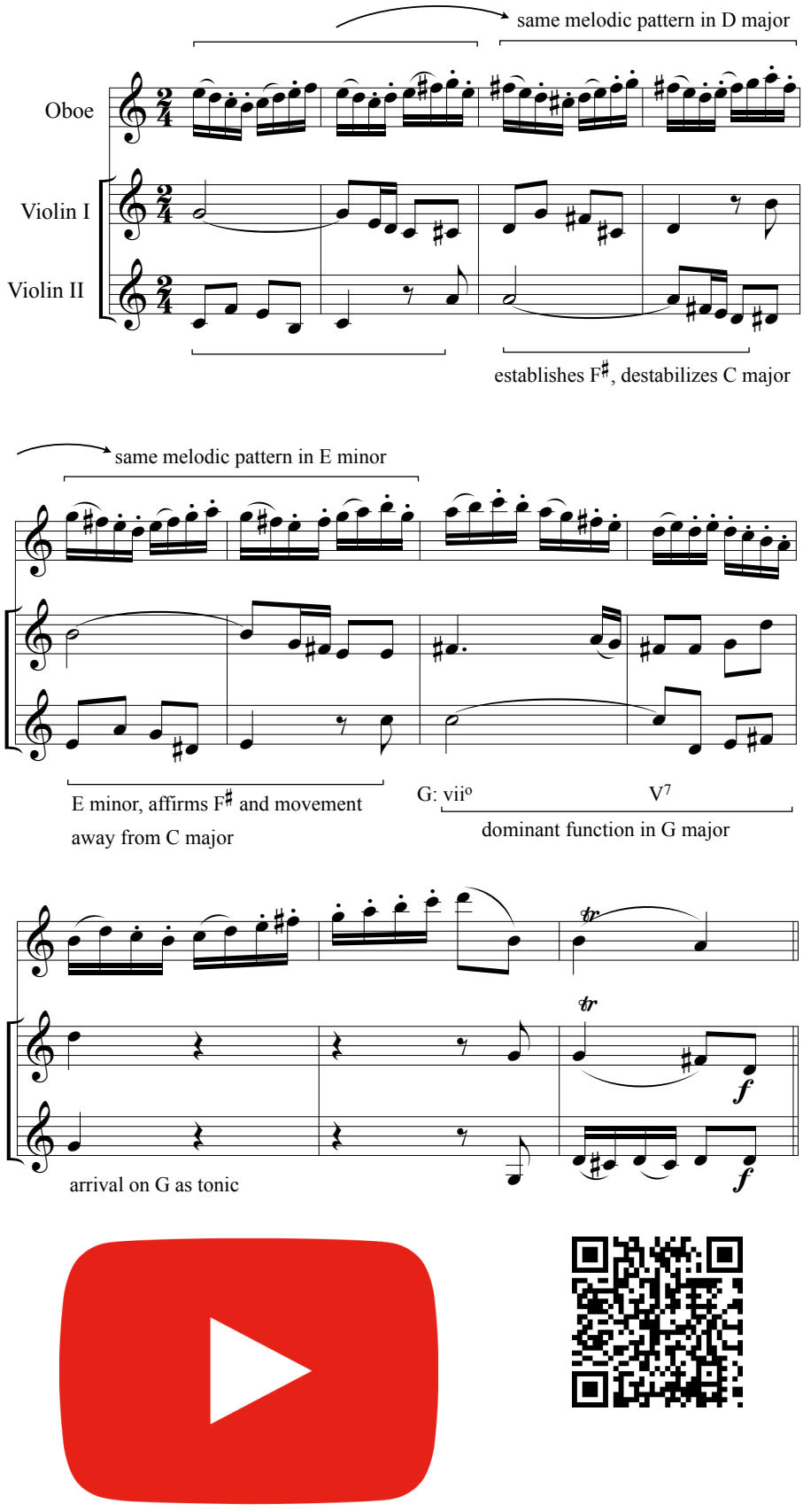


Figure 22.7.12 Mozart, Oboe Concerto in C major, K. 314, III. (1777)

In the next example, after a cadence in G minor, an idea in F minor is repeated down a whole step in E♭ minor to achieve the change of key to E♭ major, which is the starting key of this aria, as can be seen in the key signature.

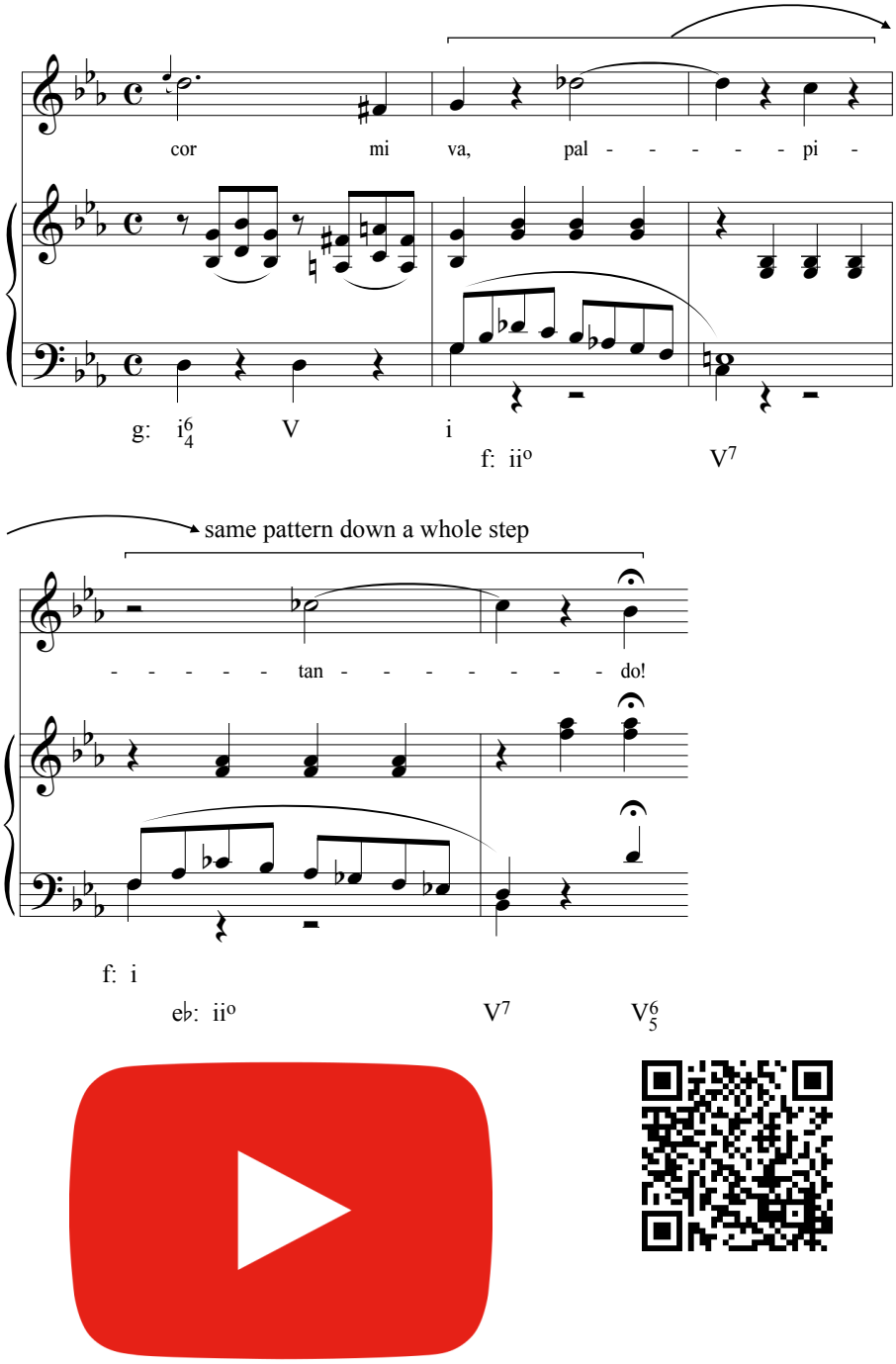


Figure 22.7.13 Mozart, *Don Giovanni*, K. 527, "Mi tradi quell'alma ingrata" (1787)

While this is by no means an exhaustive list of modulatory techniques, it should give you a sense of some of the different means composers use to change keys.

22.8 Practice Exercises

Exercise Group. Day One

1. For each given key, list the five closely-related keys.

(a) d: _____ _____ _____ _____ _____

(b) D♭: _____ _____ _____ _____ _____

(c) f: _____ _____ _____ _____ _____

2. For each progression, analyze the Roman numerals with lead-sheet symbols and specify the second key.

Lead-sheet symbols: ___ ___ ___ ___ ___ ___ ___ ___ ___

Roman numerals: F: I V^4_2 I^6 vi

___: ii I^6 ii^6 I^6_4 V^7 I

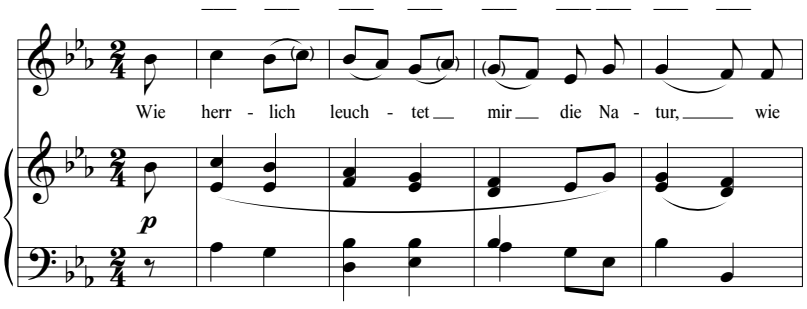
Lead-sheet symbols: ___ ___ ___ ___ ___ ___ ___ ___

Roman numerals: g: i V^6/iv iv iv^6

___: ii^6 $vii^{ø7}$/V I^6_4 V^7 I

3. For this excerpt from Beethoven's "Maigesang," do the following:

- Analyze the harmonies with Roman numerals below and lead-sheet symbols above
- Determine where the pivot chords occur and use a pivot bracket to show the Roman numerals in both keys (specify both keys)
- Label cadences
- Name the form of the excerpt



E♭: ___ ___ ___ ___ ___ ___ ___ ___ ___

(cadence type? ___)

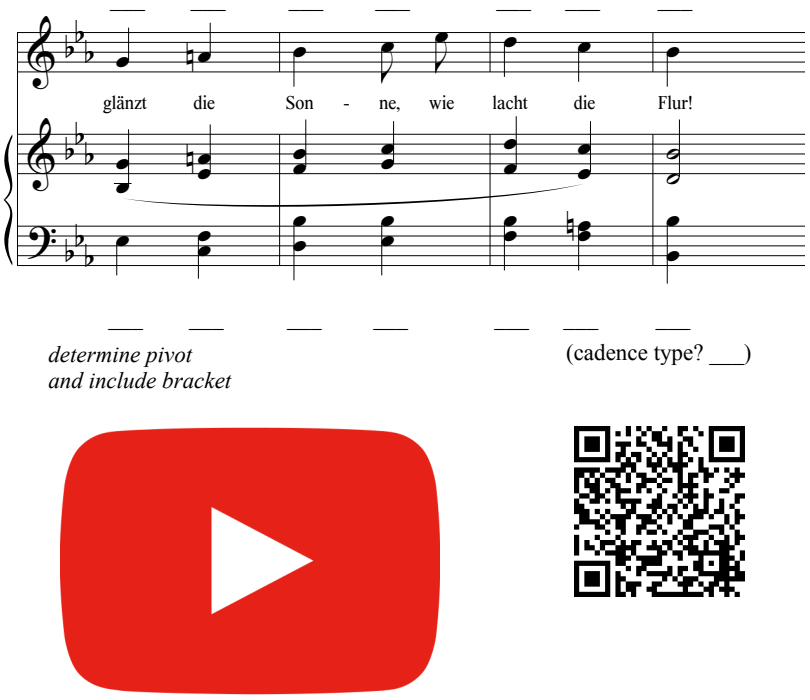
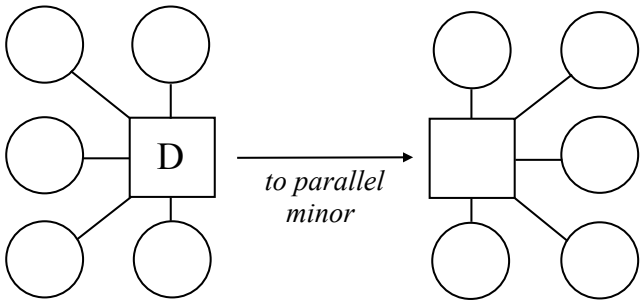


Figure 22.8.1 Beethoven, Eight Songs, Op. 52, No. 4, "Maigesang" (1805)

Exercise Group. Day Two

4. Borrowed Chord Modulation. List the closely related keys to the starting major key, then specify the parallel minor key and its closely related keys.



5. For each progression, analyze the Roman numerals with lead-sheet symbols and specify the second key.

Lead-sheet symbols: ___ ___ ___ ___ ___ ___ ___ ___ ___

Roman numerals: A: I ♭III I V_2^4/IV

___ : V_2^4 i^6 Ger^{+6} i_4^6 V^7 VI

Lead-sheet symbols: ___ ___ ___ ___ ___ ___ ___ ___

Roman numerals: g: i i^6 N^6

___ : I^6 ii^6 vii^{o7}/V I_4^6 vii^{o7}/vi vi

6. For this excerpt from Elton John's "Goodbye Yellow Brick Road," do the following:

- Analyze the harmonies with Roman numerals (the lead sheet symbols are done for you)
- Determine where to pivot into and out of A♭ major, using pivot brackets to show the Roman numerals in both keys

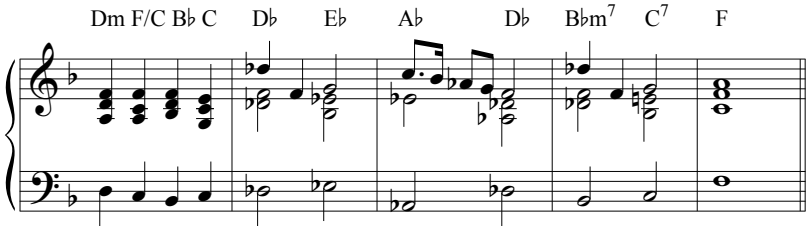


Figure 22.8.2 Elton John, "Goodbye Yellow Brick Road" (1973)

Exercise Group. Day Three

7. Determining Diatonic Common Chords. For each of the two keys in each example, list the diatonic chords as lead-sheet symbols and as Roman numerals then circle those diatonic to both keys

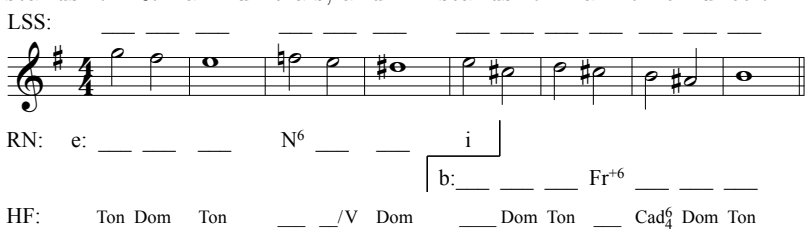
Roman numerals: d: ___ ___ ___ ___ ___ ___ ___

Lead-sheet symbols in Dm: ___ ___ ___ ___ ___ ___ ___

Lead-sheet symbols in F: ___ ___ ___ ___ ___ ___ ___

Roman numerals: F: ___ ___ ___ ___ ___ ___ ___

8. Referring to the Harmonic Flowchart, fill in lead-sheet symbols, Roman numerals, and Harmonic Functions for the following example—be sure to put some of the chords in first inversion for variety; create a melody by adding embellishments (non-chord tones) and try to create repeating motives and/or subphrases; LSS stands for lead-sheet symbols, RN stands for Roman numerals, and HF stands for Harmonic Function



Exercise Group. Day Four

9. List the four chromatic mediants for each chord.

(a) Fm: _____ _____ _____ _____

(b) D♭: _____ _____ _____ _____

(c) G: _____ _____ _____ _____

(d) G♯m: _____ _____ _____ _____

Exercise Group. Day Five

10. Analyze with lead-sheet symbols, motives (with numbers, noting melodic alteration when it occurs), Roman numerals, and harmonic function.

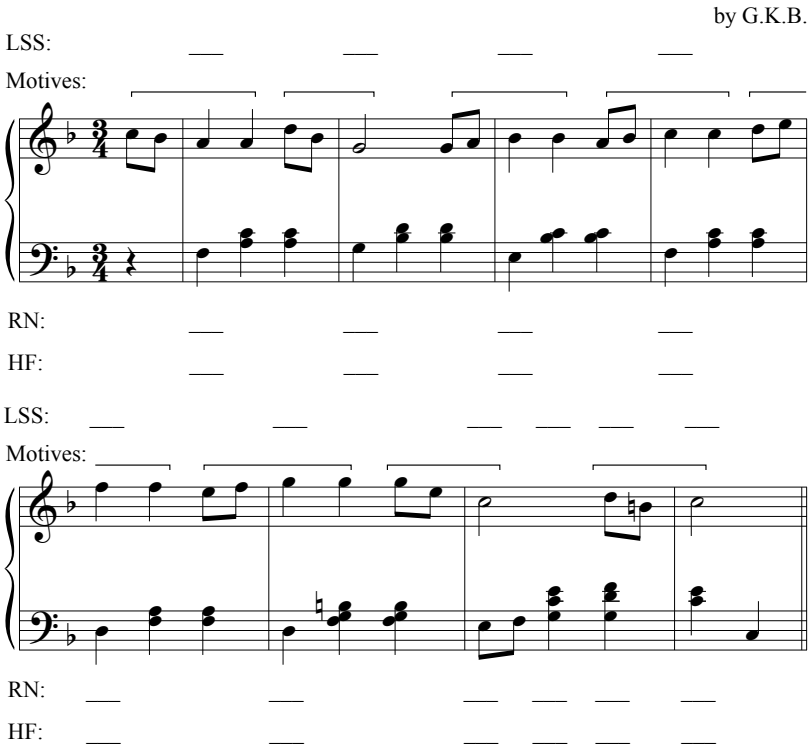


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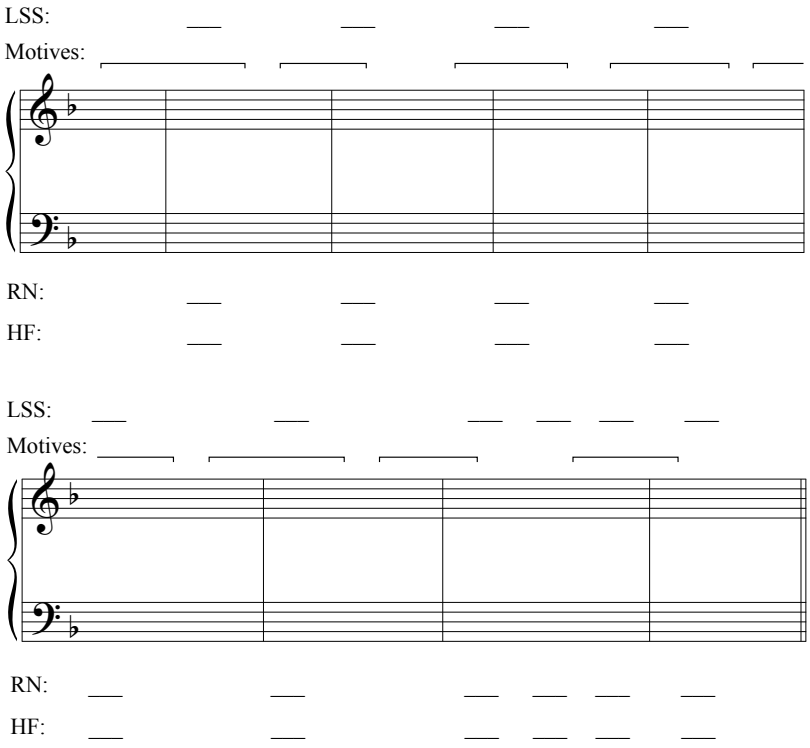
Figure 22.8.3

Compose an eight-measure example using the motivic structure and harmonic function in the example above. Create a new melody with new motives but the same sequence of motives. You may use a

different time signature, mode, and accompanimental texture.



Click here to download the first homework assignment for this chapter.

Click here to download the second homework assignment for this chapter.

Click here to download the third homework assignment for this chapter.

Click here to download the fourth homework assignment for this chapter.

Click here to download the fifth homework assignment for this chapter.

Click here to download the Unit 5 Practice Test.

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Chapter 23

Enharmonic Modulation

23.1 Enharmonic Modulation

In an **enharmonic modulation**, the pivot chord is almost always misspelled in one of the keys and therefore must be reconceptualized enharmonically by the analyst. In this regard, an enharmonic modulation is a harmonic pun.

Here is a pun from Shakespeare's *Richard III*, Act 1, Scene 1:

Now is the winter of our discontent
Made glorious summer by this sun of York

The "sun" of York is the *son* of York, King Edward IV.

Here is a simple enharmonic modulation:

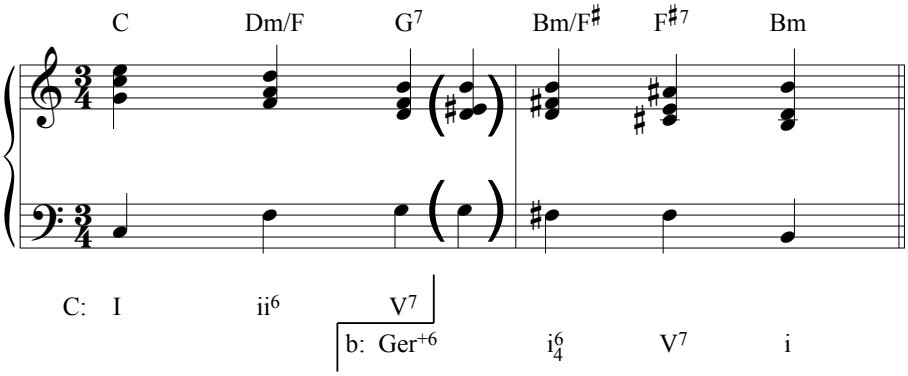


Figure 23.1.1 Enharmonic Modulation from C major to B minor

Like a verbal pun, this harmonic pun is effective because the third chord (G^7) has two "meanings"—in the context of C major, G^7 is V^7 and the root wants to cadence down a fifth to C, but the G^7 is a Ger^{+6} in the context of B minor, where the root of the G^7 wants to progress down a half step to a chord of dominant function, i^6_4 in the example above.

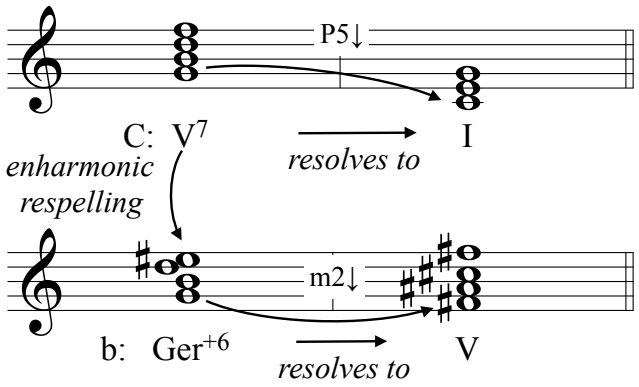


Figure 23.1.2

Notice that the G^7 can only be spelled correctly in one of the keys—either as a dominant seventh chord on G (G–B–D–F) or as a Ger^{+6} on G (G–B–D–E♯), hence the term "enharmonic modulation." The analyst must envision the other spelling (the one not shown) to understand the double context, in the same way "sun of York" must be envisioned as "son of York."

We will encounter two sonorities used in enharmonic modulations: the dominant seventh sonority and the diminished seventh sonority.

23.2 The V7 and Ger+6 as Pivot Chords

In this first type of enharmonic modulation, the pivot to the new key will consist of the V^7 being enharmonically reinterpreted as a Ger^{+6}, or the Ger^{+6} being enharmonically reinterpreted as V^7. Secondary dominants, like V^7/IV, V^7/V, etc., will also be reinterpreted harmonically as Ger^{+6} chords (and vice versa) in enharmonic modulations.

As we saw in the previous section, the dominant seventh chord and the Ger^{+6} chord have the same sound but are spelled differently. This involves a fairly straightforward enharmonic respelling. Most commonly, the top note of the chord is enharmonically respelled to envision the enharmonic alternative.

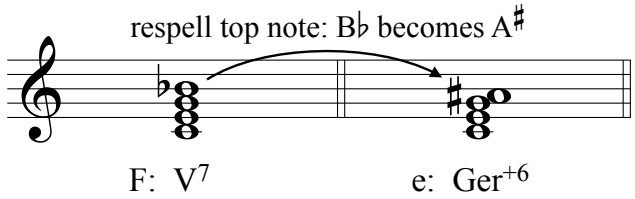


Figure 23.2.1

Each chord above implies a key based on its spelling: the dominant seventh chord occurs diatonically only on the $\hat{5}$ scale degree in major, while the Ger^{+6} chord most commonly occurs with the lowest note on the lowered $\hat{6}$ scale degree.

Less commonly, the bottom three notes could be respelled and the uppermost note could be retained as a common tone.

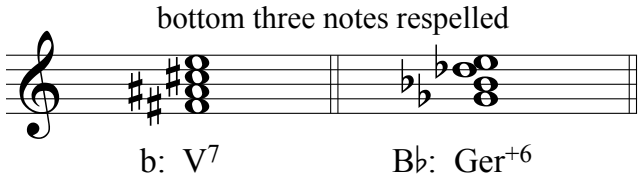


Figure 23.2.2

Remember, you will not see this respelling in the music you are analyzing. You must be able to visualize the enharmonic respelling in order to analyze the enharmonic modulation correctly.

The examples below illustrate some of the ways this enharmonic modulation occurs in pieces from the literature

In the first example from Tchaikovsky's *Nutcracker* ballet, a D^7 is spelled on the staff as D–F♯–A–B♯ so that it sounds like a V^7/IV in D major but is spelled and resolves as a Ger^{+6} in the key of F♯ minor.

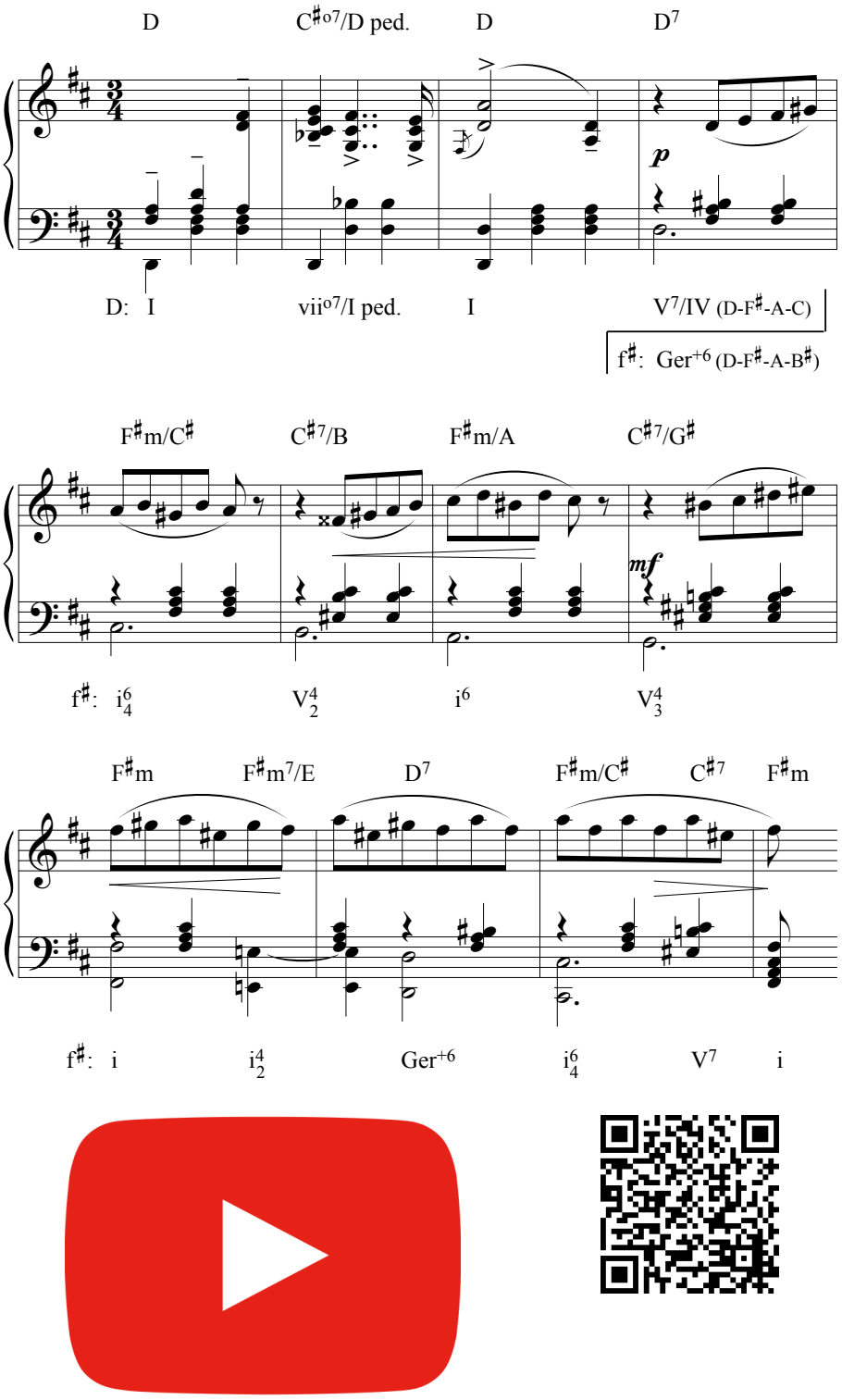


Figure 23.2.3 Tchaikovsky, *The Nutcracker*"Waltz of the Flowers" (1892)

In the following example from the second movement of Beethoven's Fifth Symphony, the same pivot chords are used as in the example above—V^7/IV in A♭ major is enharmonically respelled and resolves as a Ger^{+6} in C major.

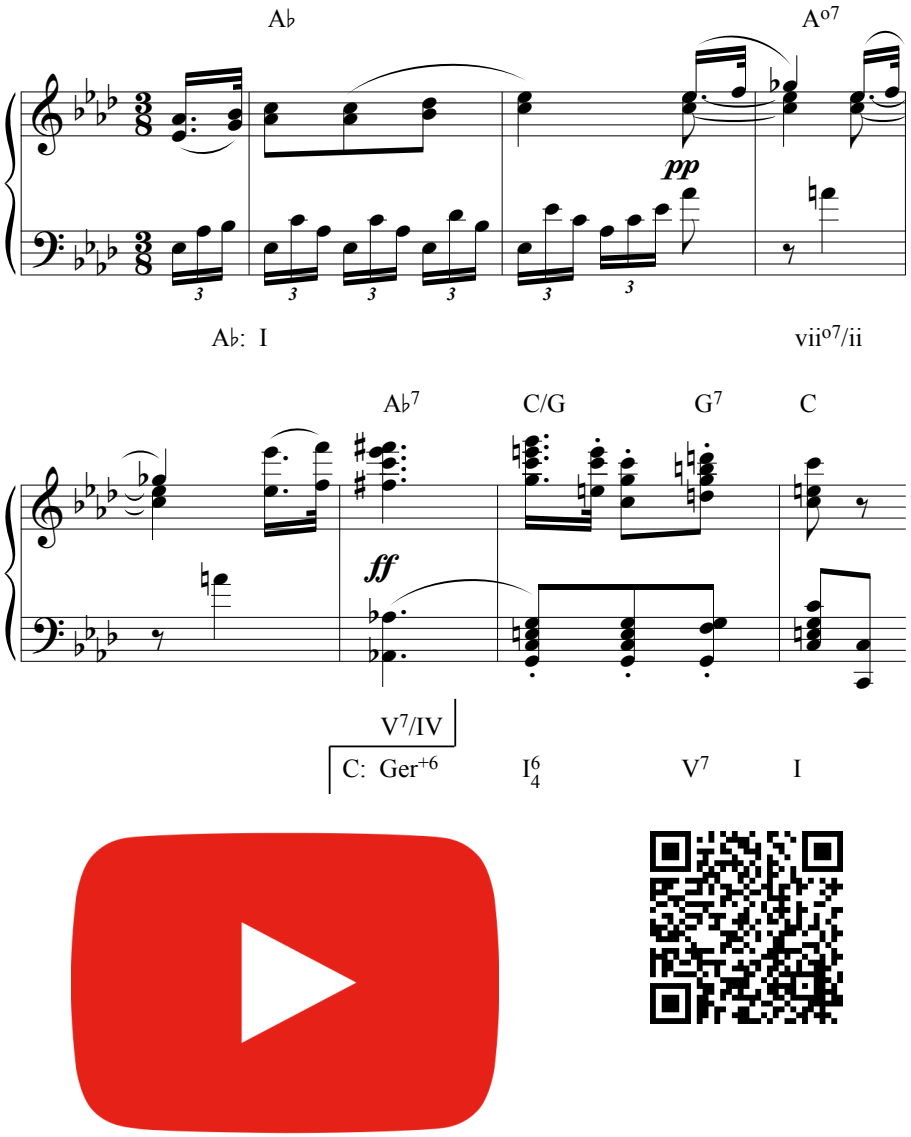


Figure 23.2.4 Beethoven, Symphony No. 5, Op. 67, II (1808)

In the following example from *Les Miserables*, a Ger^{+6} in E minor is spelled as a V^7 chord in F major and resolves to the I chord F major.

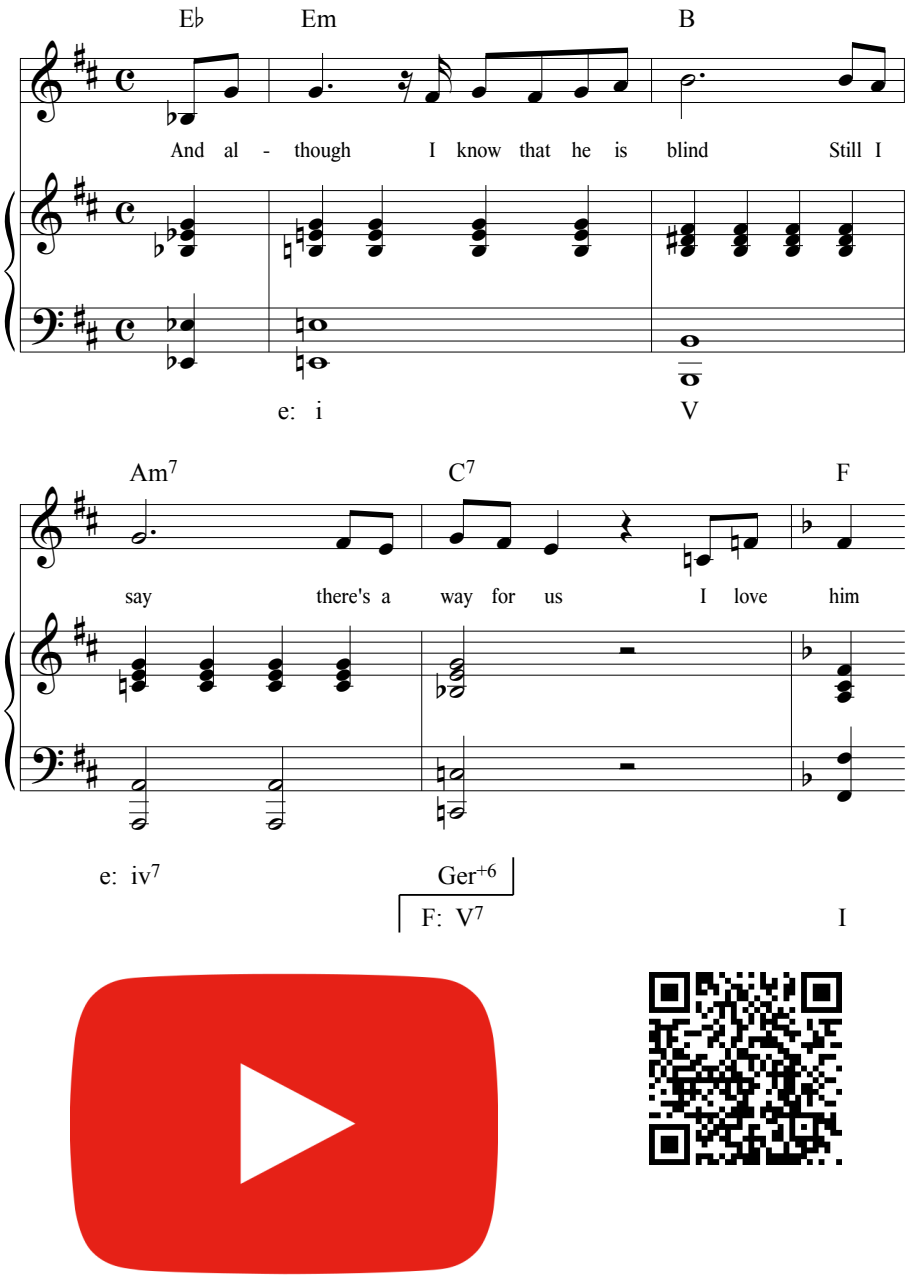


Figure 23.2.5 Music by Claude-Michel Schönberg, lyrics by Alain Boublil, Herbert Kretzmer, John Caird, Trevor Nunn, and Jean-Marc Natel, *Les Miserables*, "On My Own" (1980)

In the next section we will examine how the fully diminished seventh chord can be enharmonically reinterpreted.

23.3 The Fully Diminished Seventh as Pivot Chord

Each diminished seventh sonority implies *four* different keys. Play and sing through the example below.

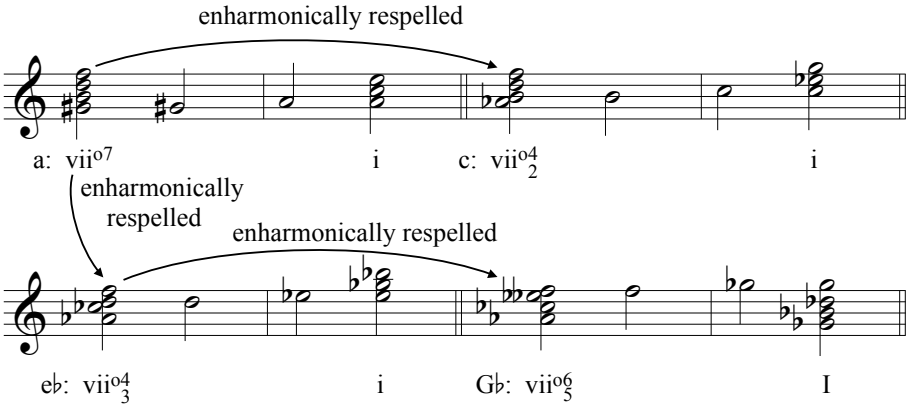


Figure 23.3.1 The Four Resolutions of a Diminished Seventh Sonority

In the example above, each note of the vii°7 chord was treated in turn as scale degree $\hat{7}$ and resolved up by half step. In the example below, each note of the chord resolves as if it were the 7th of the chord, moving down by half step to the root of a dominant seventh chord.

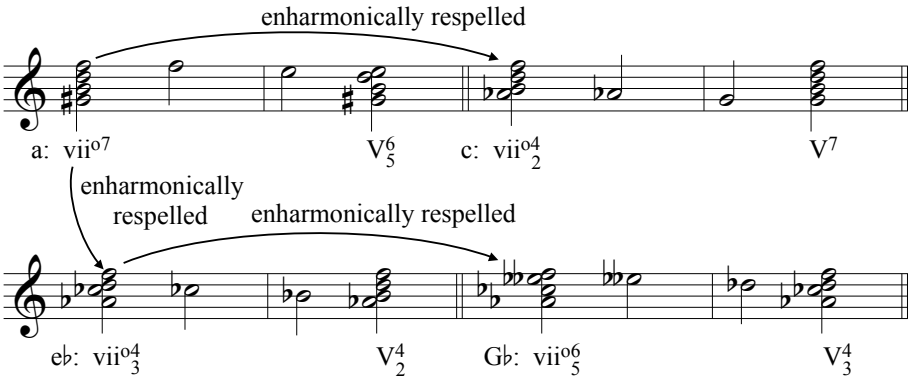


Figure 23.3.2 Resolutions of a Diminished Seventh Sonority to a Dominant Seventh Sonority

This means that for any diminished seventh chord, you should be able to imagine the other three respellings in the same way you can imagine other spellings of words like *two* (i.e., *to* and *too*) or *there* (*their* and *they're*).

In the following examples, a vii°7 chord is enharmonically reinterpreted in a new key.

In the first example, Beethoven enharmonically reinterprets $\mathrm{F}^{\sharp\circ 7}\big/\mathrm{C}$ in G minor ($\mathrm{vii}^{\circ 4}_{3}$) as $\mathrm{vii}^{\circ 4}_{2}$ in E minor ($\mathrm{D}^{\sharp\circ 7}\big/\mathrm{C}$), which resolves to a V^7 chord in E minor.

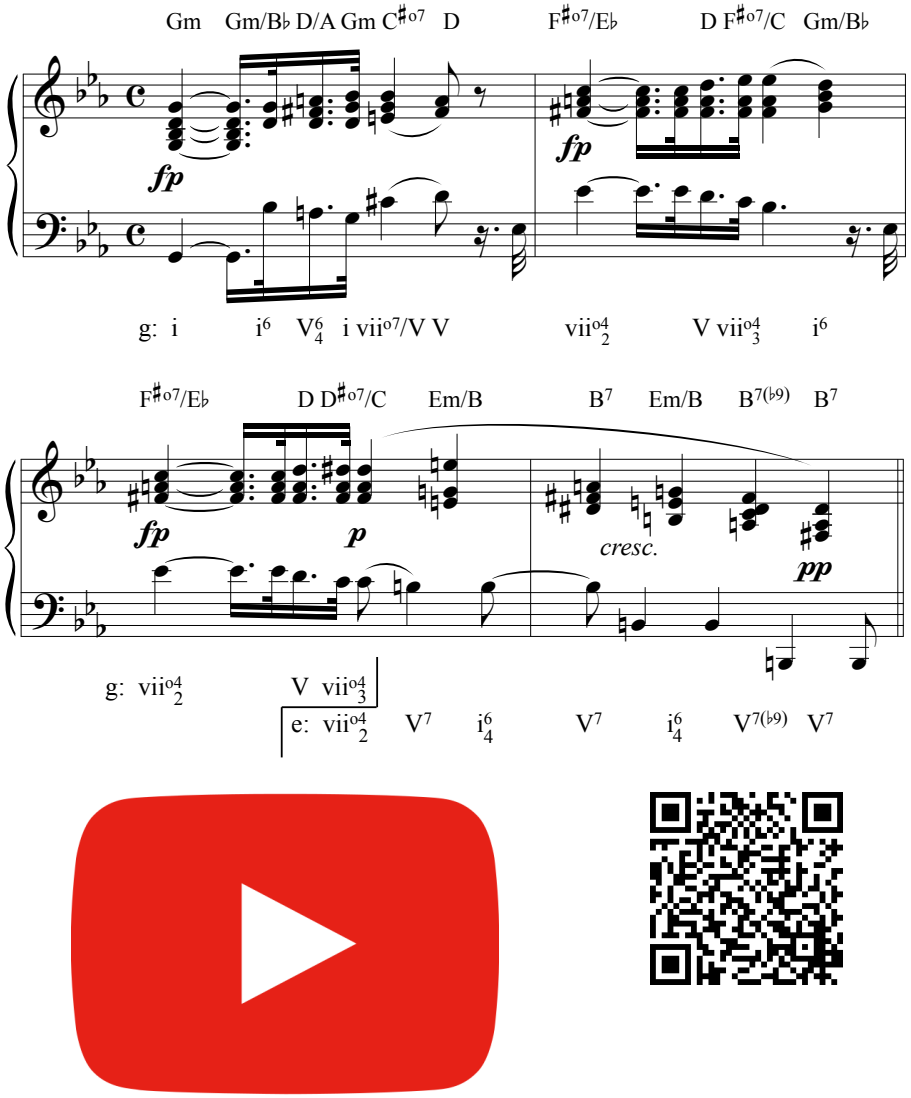


Figure 23.3.3 Beethoven, Pathétique Sonata, Op. 13, I (1798)

In the next example from the second movement of Beethoven's Fifth Symphony, Beethoven modulates from C major to A♭ major by enharmonically reinterpreting an $E^{\circ 7}$ chord in C ($vii^{\circ 7}/IV$) as $vii^{\circ 4}_{2}$ in A♭ ($G^{\circ 7}/F^{\flat}$). Notice the unusual resolution of the $vii^{\circ 4}_{2}$ chord to a Ger^{+6} chord by leading all three of the upper voices of the $vii^{\circ 4}_{2}$ up by half step to the Ger^{+6}, which itself is unusually spelled in the key of A♭ major (E–A♭–C♭–D instead of F♭–A♭–C♭–D).

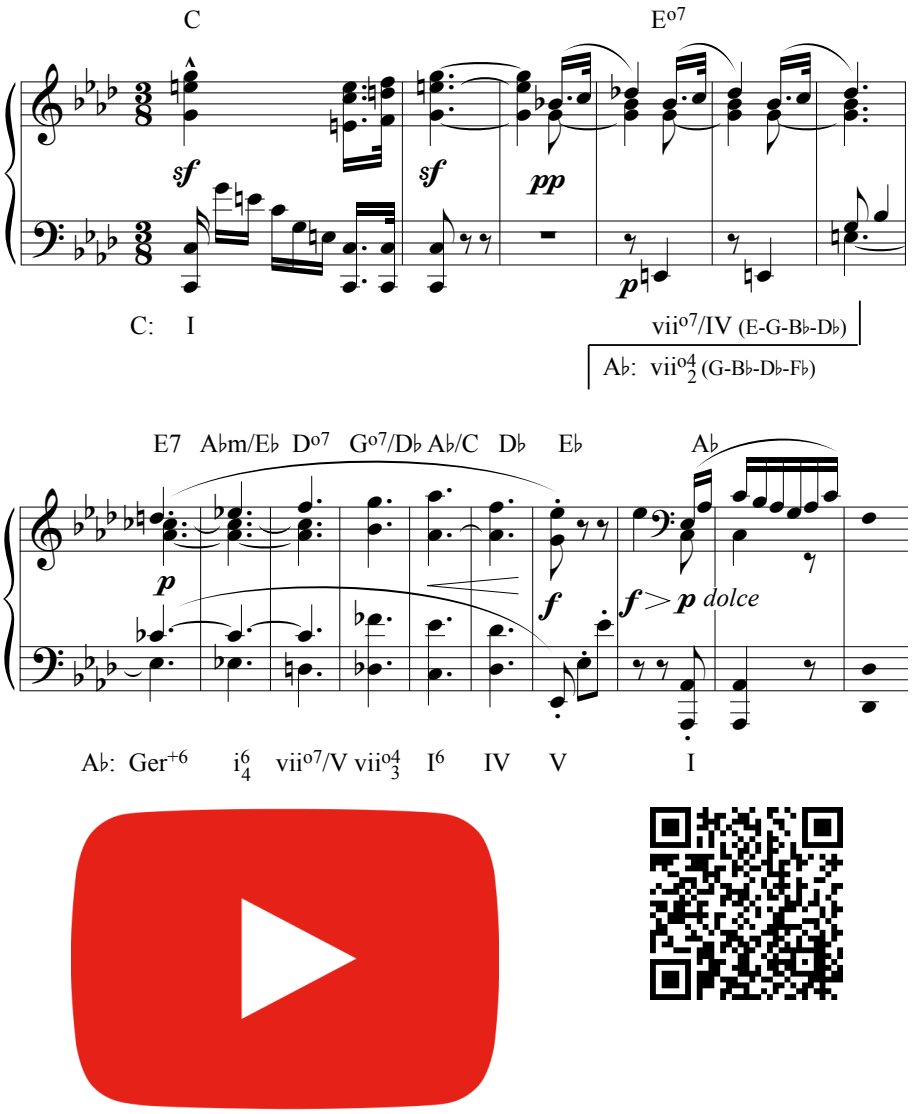


Figure 23.3.4 Beethoven, Symphony No. 5, Op. 67, II (1808)

In the final example of this section, Schubert reinterprets a $G^{\sharp\circ 7}$ in G minor as an $E^{\sharp\circ 7}$ chord in B minor ($\text{vii}^{\circ 6}_{5}/\text{V}$). The $G^{\sharp\circ 7}$ chord in G minor is analyzed as $\text{vii}^{\circ 4}_{2}/\text{iv}$, meaning it could resolve to a C minor chord, but it could also have been interpreted as $\text{vii}^{\circ 4}_{3}/\text{VI}$, or as tonicizing an E♭ major chord. Because the chord never resolves in G minor, one cannot be certain of the intended resolution. Remember that diminished triads are not tonicized, so the $G^{\sharp\circ 7}$ would not be considered as tonicizing the note A (the root of the ii° chord) or F♯ (the root of the vii° chord).

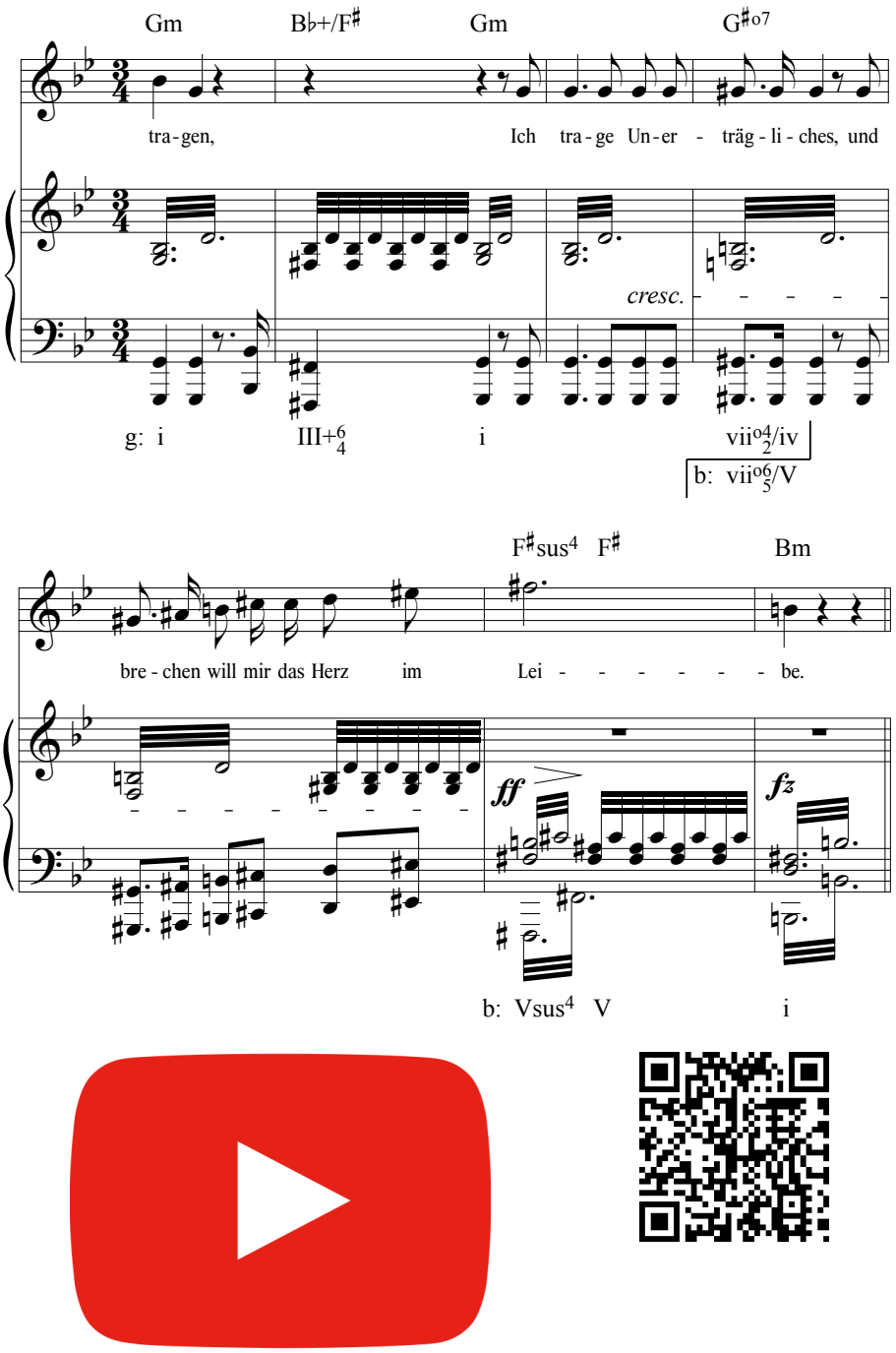
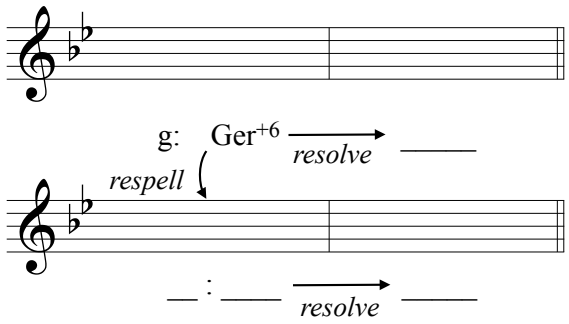


Figure 23.3.5 Schubert, *Schwanegesang*, D. 957, "Der Atlas" (1828)

23.4 Practice Exercises

Exercise Group. Day One

1. Notate the specified chord, resolve it, then notate and resolve the enharmonic respelling(s).

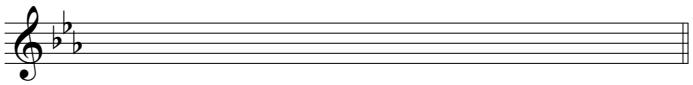


2. For the following Roman numeral progressions, label the chords with lead-sheet symbols, specify the new key, and notate all of the chords in the appropriate inversion on the staff below. The enharmonic pivot chord can be spelled correctly in only one of the two keys.

Lead-sheet symbols: ___ ___ ___ ___ ___ ___ ___ ___ ___

Roman numerals: E♭: I ♭VI IV V^7/V

___: Ger^{+6} i^6_4 V^4_2 vii^{o7}/iv iv V



3. Analyze with lead-sheet symbols and Roman numerals and label the enharmonic pivot chords in the examples below.

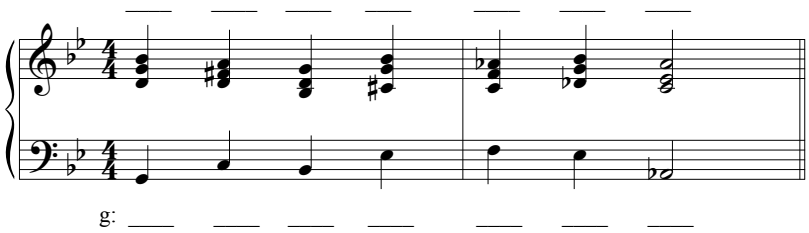


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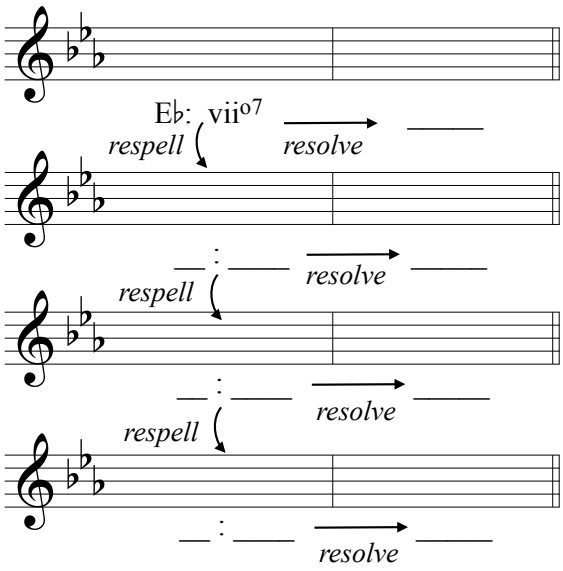
Figure 23.4.1

Exercise Group. Day Two

4. Notate the specified chord, resolve it, then notate and resolve the

enharmonic respelling(s).



5. Analyze with lead-sheet symbols and Roman numerals and label the enharmonic pivot chords in the examples below.

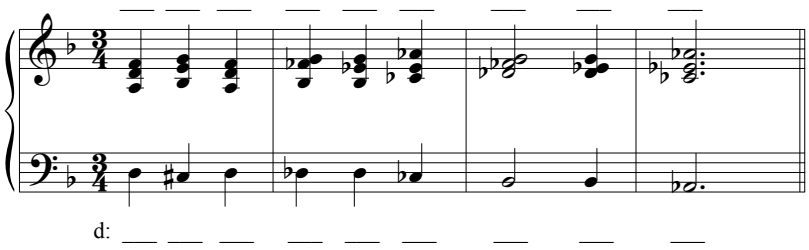


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Figure 23.4.2

Click here to download the first homework assignment for this chapter.
Click here to download the second homework assignment for this chapter.
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Chapter 24

Binary and Ternary Forms

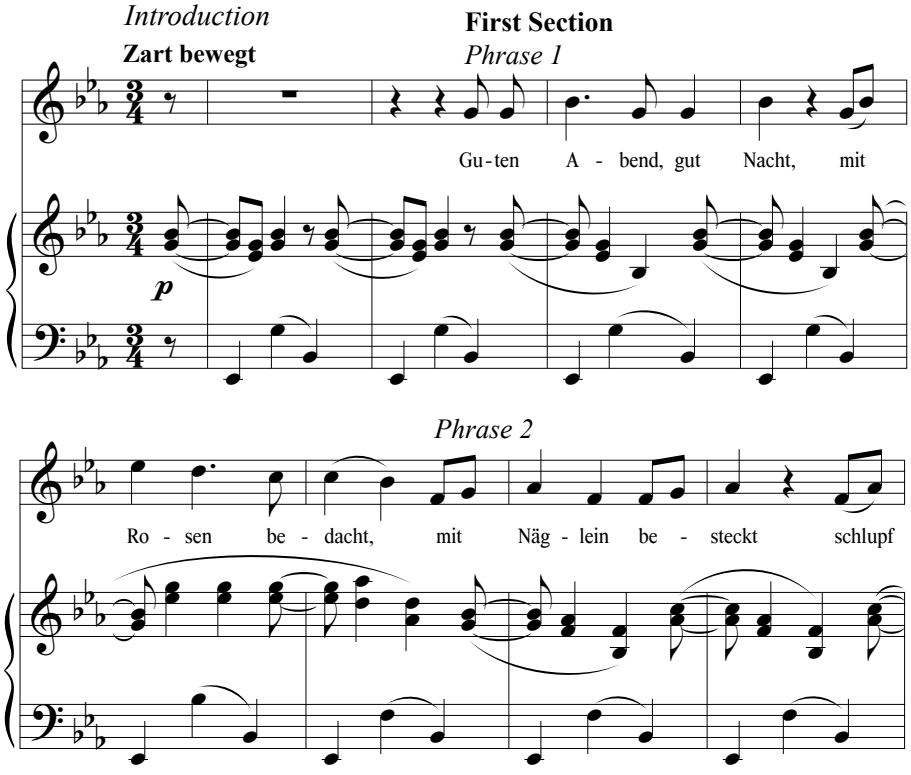
24.1 Binary and Ternary Form

In this chapter we will compare the following:

Sectional versus Continuous
Binary versus Ternary
Rounded Binary versus Ternary

24.2 Sectional versus Continuous

We apply the descriptor "**sectional**" to a binary or ternary form when the first section (the A section) ends on the tonic. (Note: We use lowercase letters to refer to phrases and uppercase letters to refer to sections.)



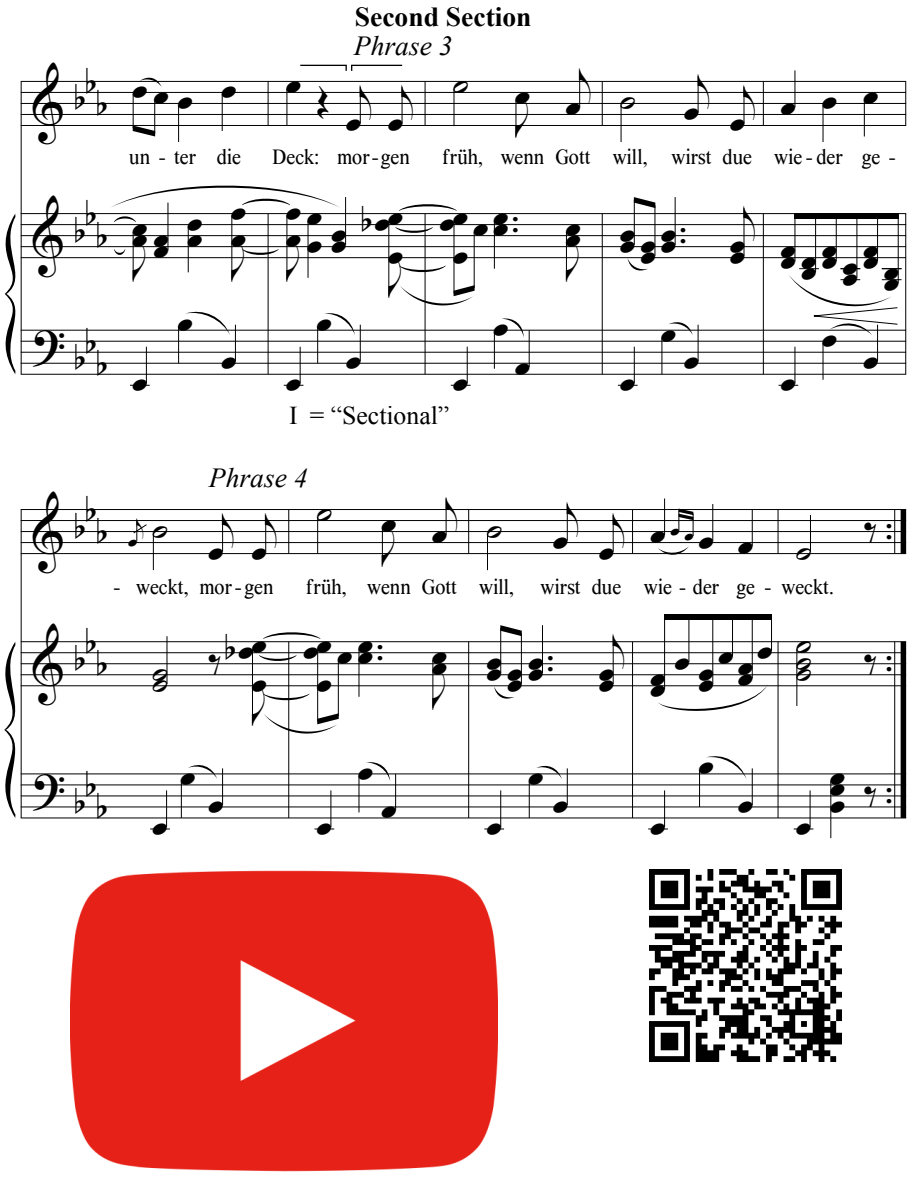
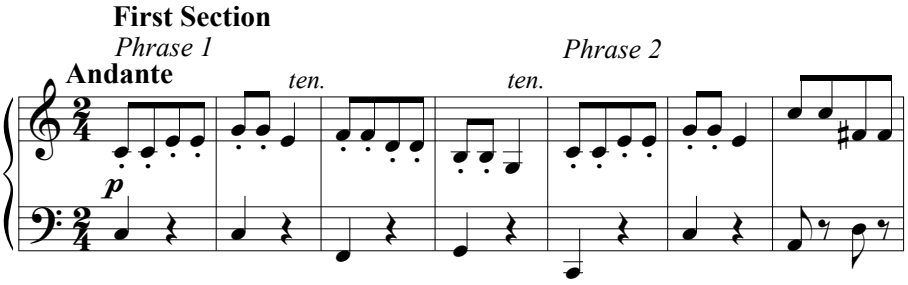


Figure 24.2.1 Johannes Brahms, *Fünf Lieder*, Op. 49, No. 4 "Wiegenlied" (1868)

The term "**continuous**" is used when the first section of a binary or ternary form does *not* end on the tonic chord. While this often means the first section ends in a new key, it can also mean the first section ends on the dominant chord in a half cadence.



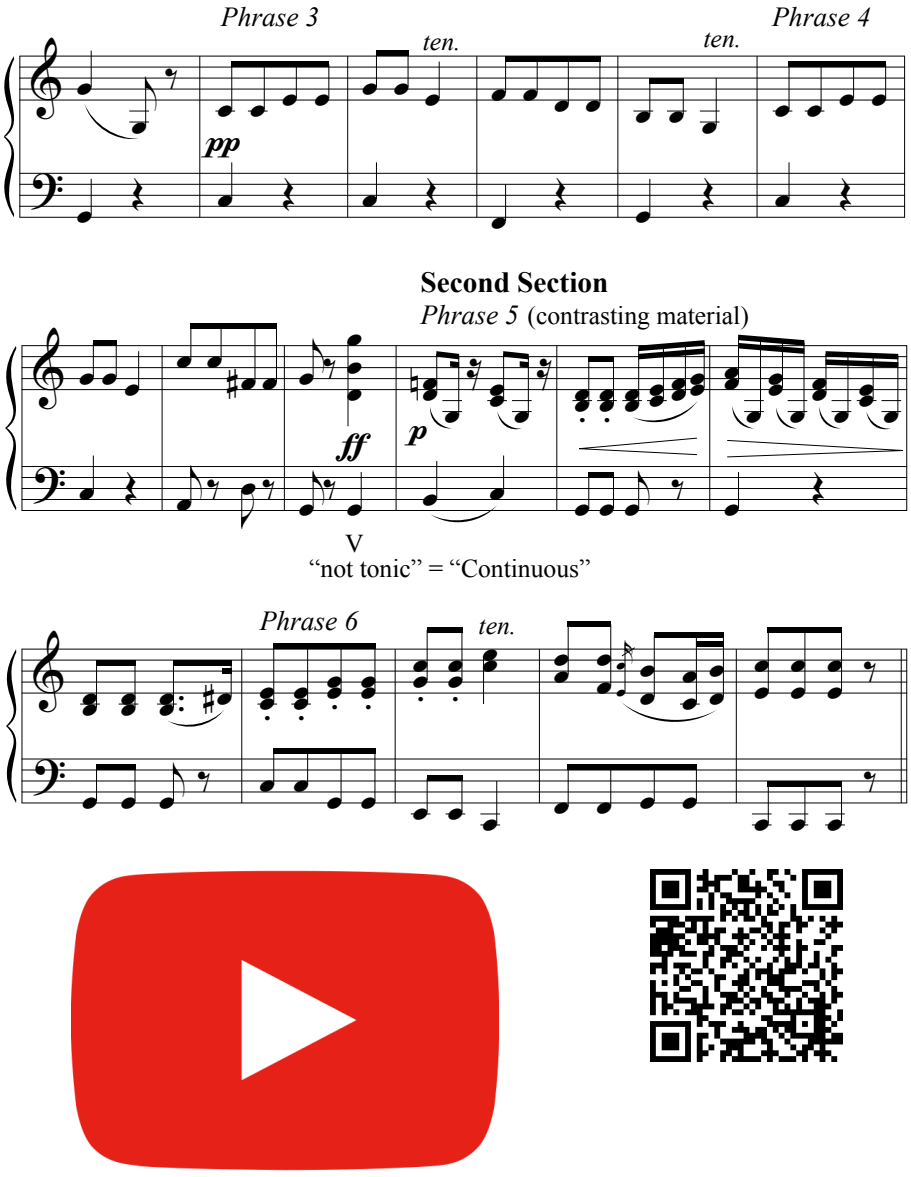


Figure 24.2.2 Joseph Haydn, Symphony No. 94 in G major, Hob. I:94, II (1791)

In naming any binary or ternary form, use the terms sectional or continuous before binary or ternary, for example "*sectional* binary," "*continuous* binary," "*sectional* ternary," or "*continuous* ternary."

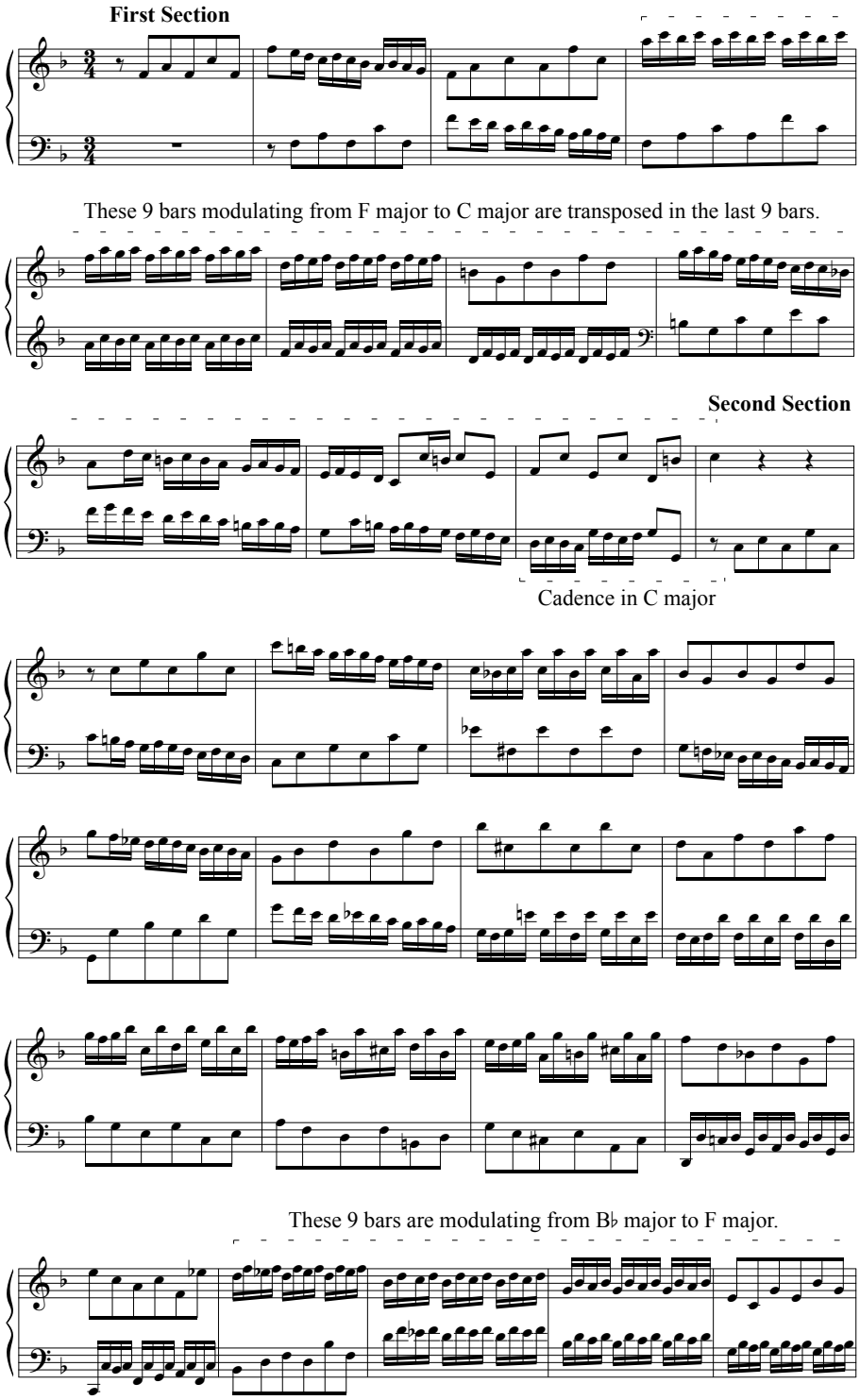
Other descriptors include "**two-reprise**," which means *both* the first section (the A section) and second section (the A' or B section) are repeated, and "rounded," used in conjunction with binary ("rounded binary") to specify that the opening material returns after the contrasting section.

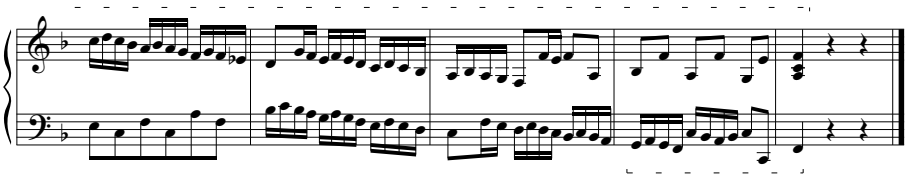
In the following sections we will discuss three types of binary forms:

1. Balanced Binary
2. Rounded Binary
3. "Simple" Binary (usually called "binary")

24.3 Balanced Binary

A **balanced binary** form, according to Douglass Green in his book, *Form in Tonal Music*, features a binary form with a first section (the A section) ending in a new key, and the second section ending *with essentially the same cadence*, now transposed to the original key, as in the following piece by Bach.





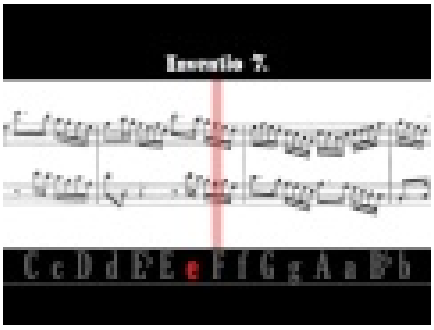


Figure 24.3.1 J.S. Bach, Invention No. 8 in F major, BWV 779

Because the first section of a balanced binary ends in a new key, it is inherently a *continuous* binary form.

Balanced binary form can be found in movements from the Baroque era, including dance suites by Bach, Handel, and others. The movement below shows the endings of the first and section sections of the Courante from J.S. Bach's French Suite No. 6 in E major, BWV 817.

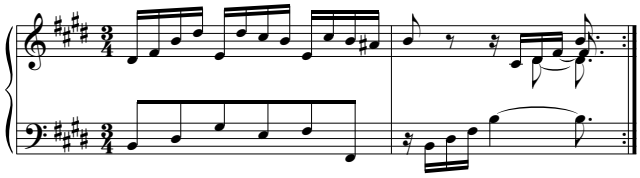
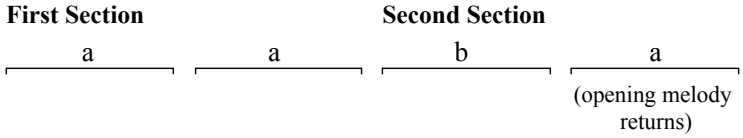


Figure 24.3.2 J.S. Bach, French Suite No 6 in E, BWV, 817 Courante, bars 15–16

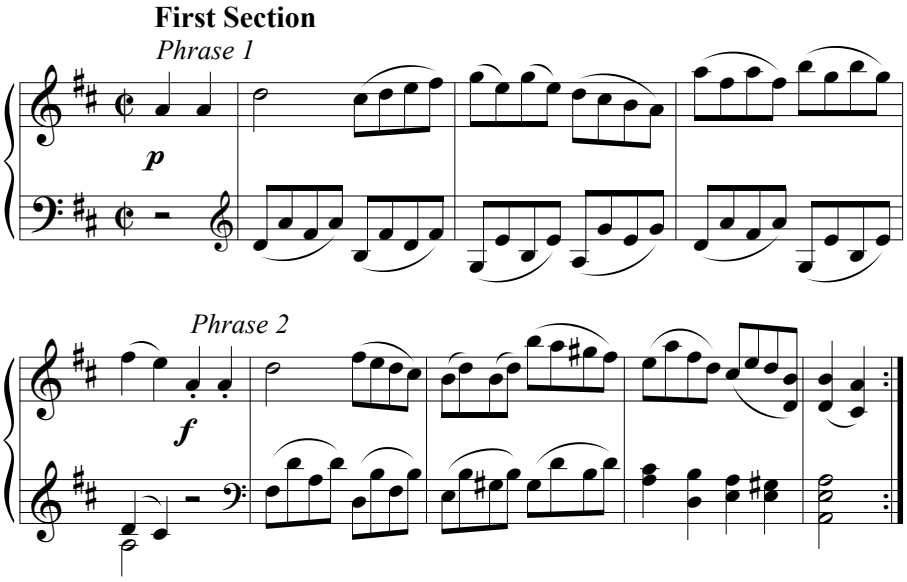
Figure 24.3.3 J.S. Bach, French Suite No 6 in E, BWV, 817 Courante, bars 31–32

24.4 Rounded Binary

In a **rounded binary** form, the material at the beginning of the first section returns, often shortened, after a contrasting phrase at the beginning of the second section. A generic phrase diagram of rounded binary form is shown below.



Below is an example of a rounded binary form.



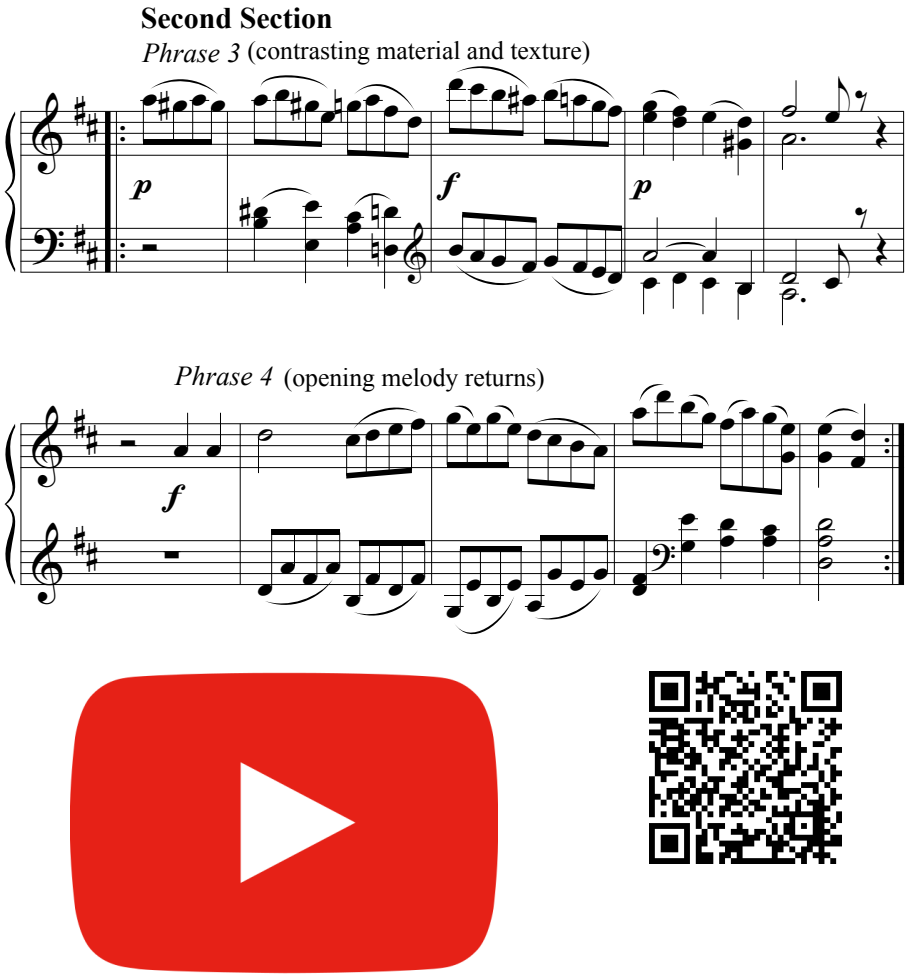
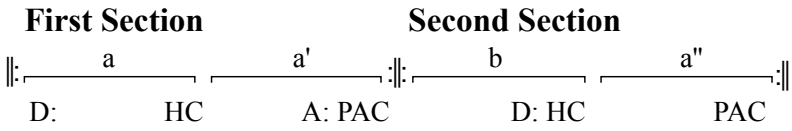
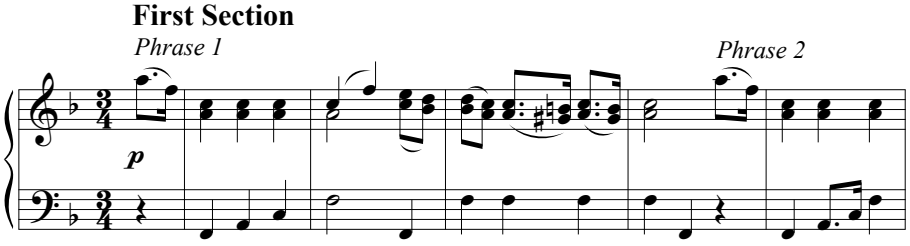


Figure 24.4.1 Mozart, Piano Sonata in D major, K. 284, III.



Because both the first section (the A section) and second section (the B section) repeat in the example above, this form would be called "two-reprise continuous rounded binary form."

Another example of a rounded binary form is below.



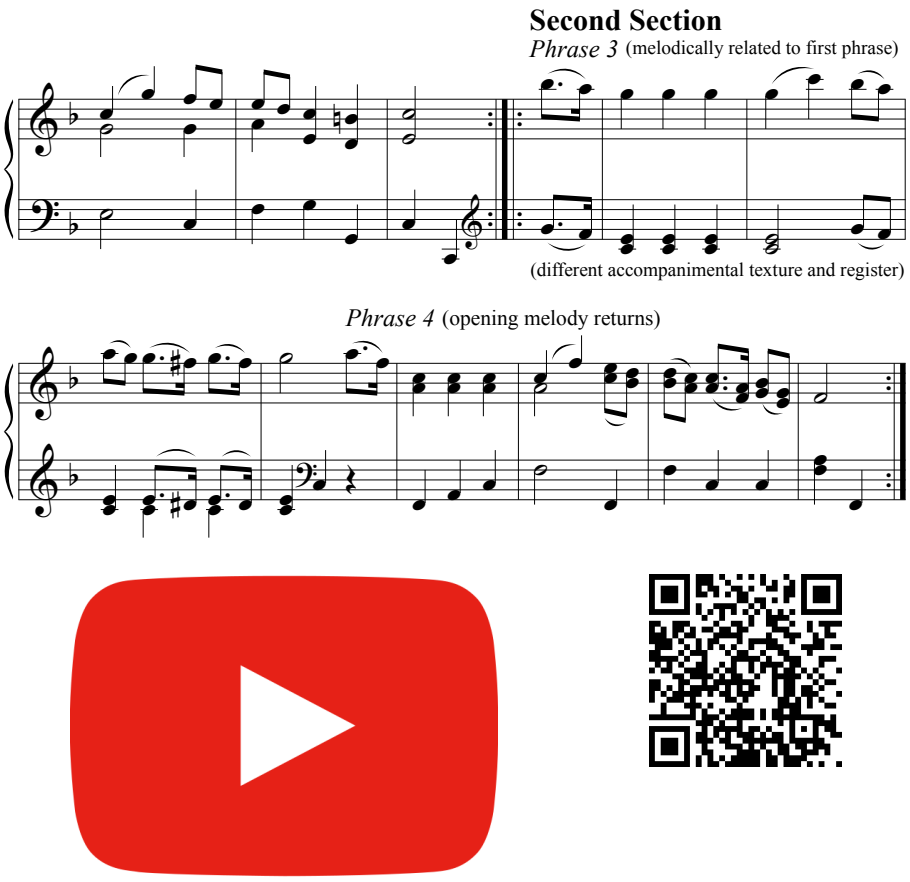


Figure 24.4.2 Schubert, 20 Minuets, D. 41, No. 18 in F major

This form of the example above would be called "two-reprise continuous rounded binary form" because:

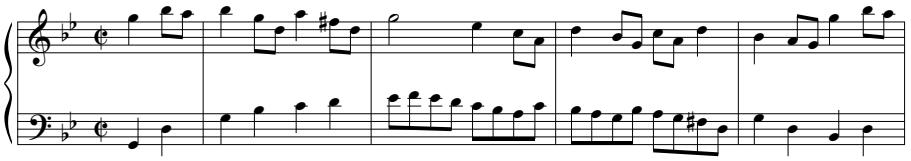
- "Two-reprise" means both the first and second sections repeat
- "Continuous" means the first section does not end on the tonic chord
- In a rounded binary form the opening melody returns after contrasting material

Rounded binary form is often encountered in compositions during the Classical era (1750–1825) in music by Haydn, Mozart, and Beethoven, especially as the form of a theme from a theme and variations, and as the minuet and/or trio section in a Minuet and Trio.

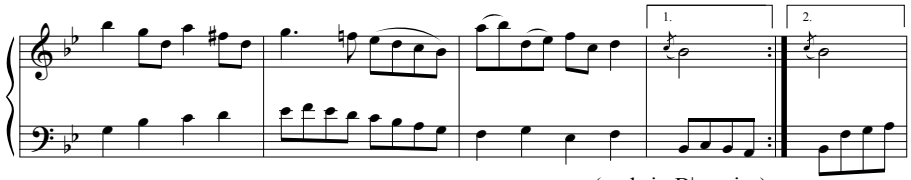
24.5 Simple Binary

"Simple" binary is a term used to describe a binary form that does not have features like the similar endings of a balanced binary or the return of opening material like the rounded binary. You will encounter this type of binary form in music especially throughout the Baroque era, as well as in the early Classical era.

First Section

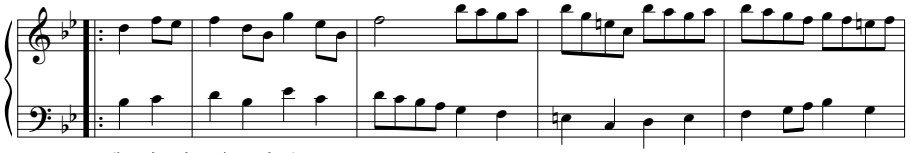


(starts in G minor)

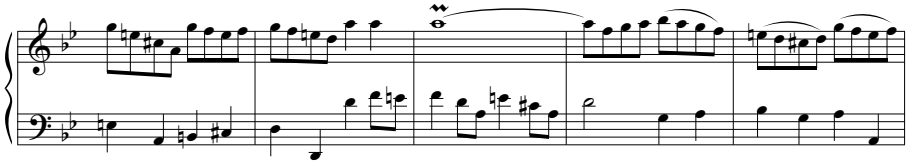


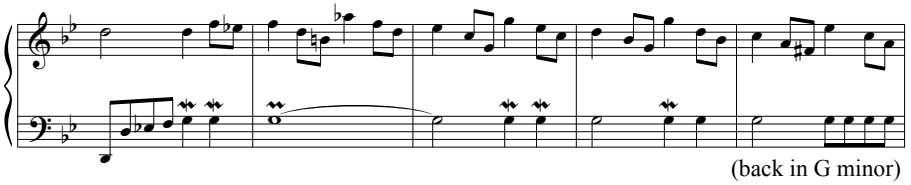
(ends in B♭ major)

Second Section (develops melody and motives from first section)

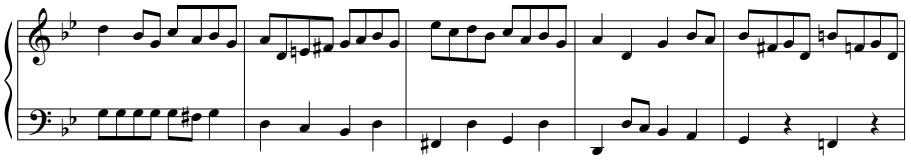


(begins in B♭ major)

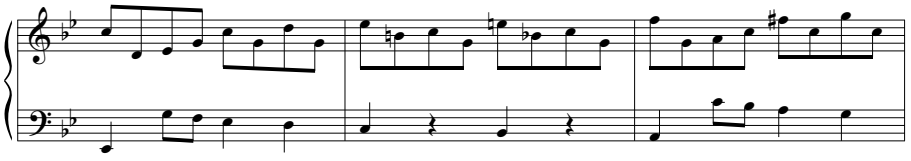




(back in G minor)



(opening melody does not return—not rounded binary)



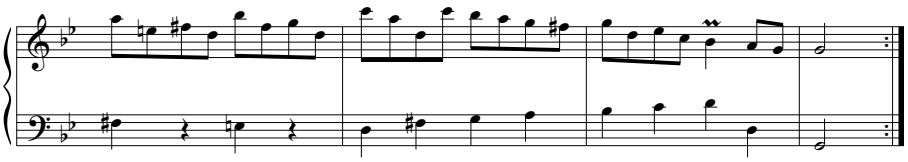


Figure 24.5.1 J.S. Bach, English Suite No 3 in G minor, BWV 808, Gavotte I.

Notice in the example above that the first section and second section can begin similarly in a binary form, resulting in the large-scale form AA'. The second section often features development of the primary idea from the first section. We will discuss development in the next chapter.

24.6 Binary Principle

Binary principle, as defined by Peter Spencer and Peter Temko in their book *A Practical Approach to the Study of Form in Music*, states that the first section of a binary form modulates to a new key and the second section modulates back to the first key. We find this principal exemplified in a high percentage of binary forms in the Baroque era, and diagrammed in the example below.

First Section			Second Section		
Major: I	modulation	V	V	modulation	I
Minor: i	modulation	III (or v)	III or (v)	modulation	i
Original key		New key			Original key

Figure 24.6.1 Diagram illustrating Binary Principle

24.7 Ternary Form

Ternary form is usually diagrammed as ABA and is described as "statement, digression, restatement."[1] A piece in a rather simple and straightforward ternary is shown below.

[1] Green, Douglass M. *Form in Tonal Music: an Introduction to Analysis*. 2d ed., Holt, Rinehart and Winston, 1979, p. 84

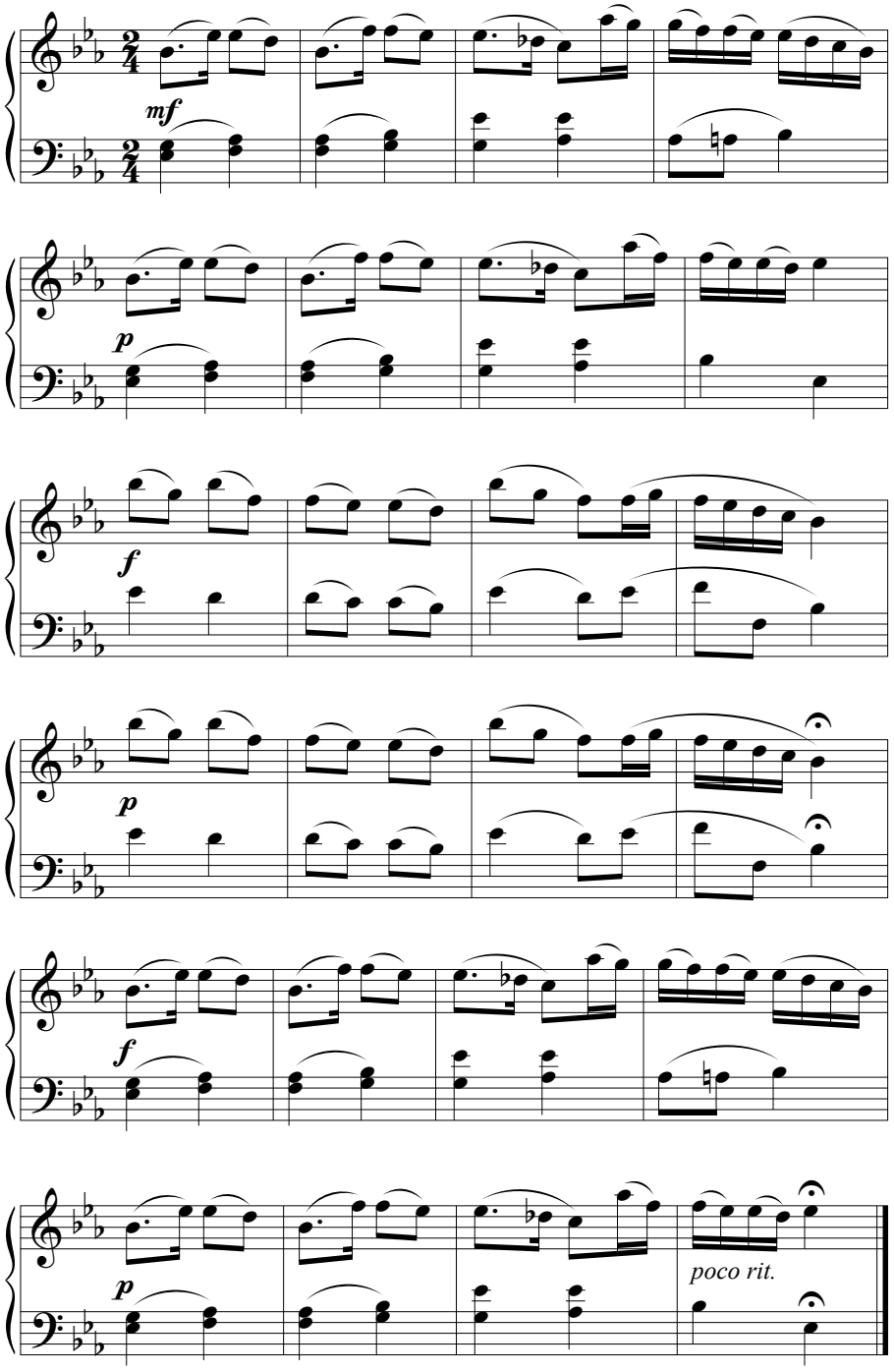

mf
p
f
p
f
p
poco rit.

Figure 24.7.1 Mozart, Andante in E-flat major, K. 15mm

Below is a diagram of K. 15mm by Mozart.

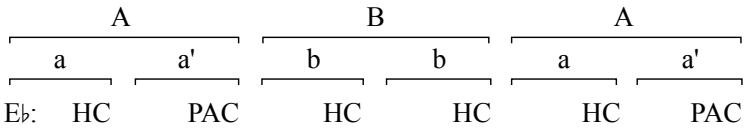


Figure 24.7.2 Diagram illustrating Binary Principle

Character pieces from the Romantic era with titles such as "Nocturne," "Intermezzo," and "Song Without Words," among others, by composers such as Schubert, Chopin, Mendelssohn, Schumann, and Brahms, are often in a larger ternary form where each section might be longer than eight bars.

Below are examples from a larger ternary piece, Rachmaninov's Prelude in C-sharp minor, Op.3 No.2.

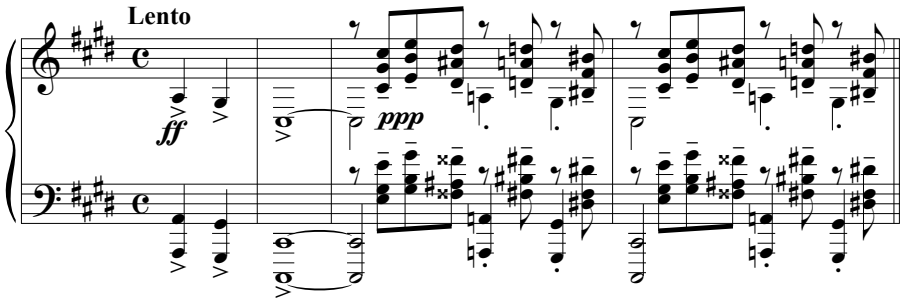


Figure 24.7.3 Sergei Rachmaninoff, Prelude in C-sharp minor, Op. 3 No. 2, First A section bars 1–13

Figure 24.7.4 Rachmaninov, Prelude in C-sharp minor, Op.3 No.2, B section bars 14–42

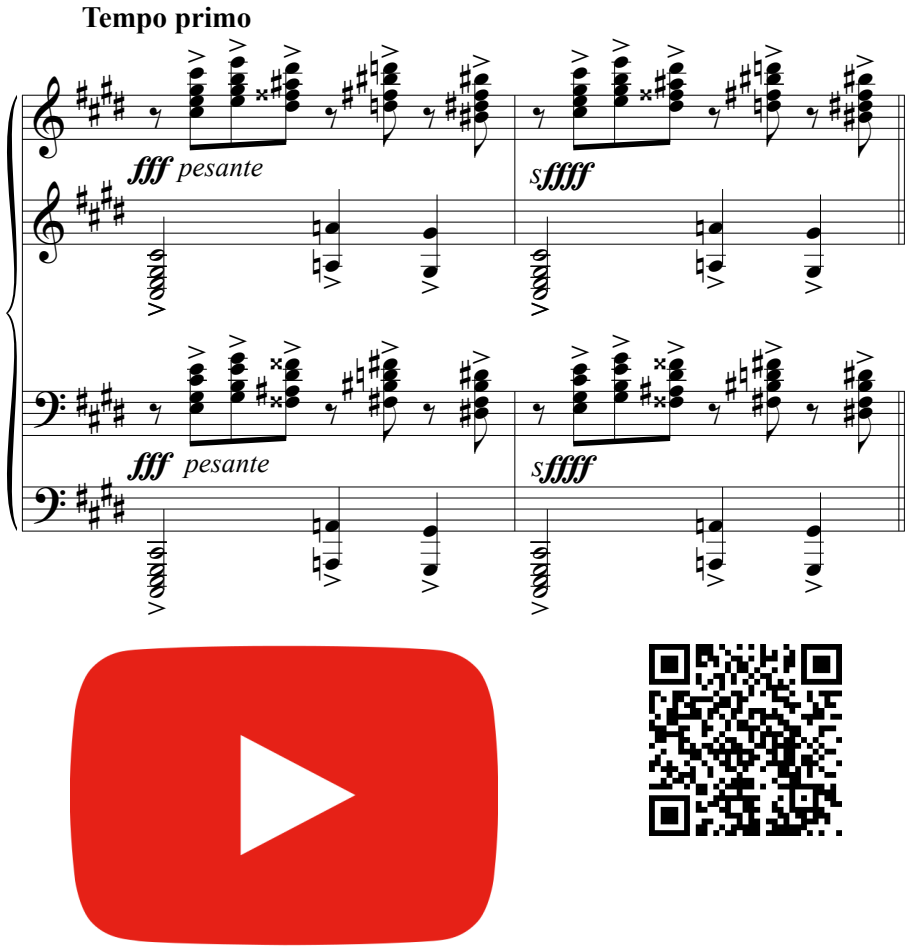


Figure 24.7.5 Rachmaninov, Prelude in C-sharp minor, Op.3 No.2, Second A section bars 45–61

24.7.1 Compound Ternary

A **compound ternary** is a ternary form in which one of the sections (the A or the B) is itself a binary or ternary form. Examples can be found in the minuet and trio as well as the da capo aria.

In the next section, we will examine the differences between rounded binary and ternary.

24.8 Distinguishing between Rounded Binary and Ternary

In homework and on the test, you will encounter pieces that are five or six phrases long that could be rounded binary or ternary. While other authors have their own means to differentiate rounded binary from ternary, this text offers the following criteria to consider:

1. *Proportion*: consider the proportion of the contrasting section to the other sections. If the contrasting section is too small to stand alone, the form is more likely to be rounded binary.

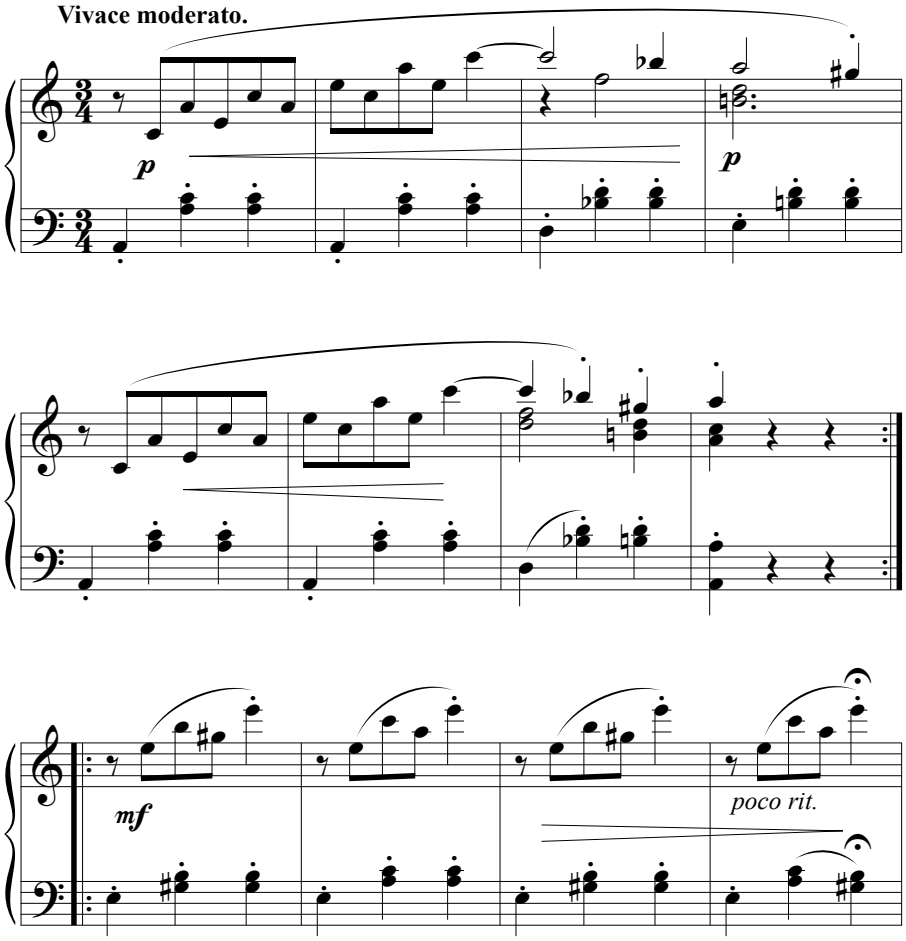
2. *Nature*: consider the nature of the contrasting section.

   (a) If the melody is built from motives from the first section, the form is likely to be a rounded binary. Ternary form will have a contrasting melody in the contrasting section.

   (b) If the harmony consists mostly of a dominant pedal, or a V chord alternating with a I or I_4^6 chord, the form is likely to be a rounded binary.

3. *Era*: consider the era when the piece was written. A piece by a Baroque composer (J.S. Bach, Handel, Scarlatti, Couperin) or Classical composer (Haydn, Mozart, and Beethoven) is more likely to be in rounded binary form, whereas a piece by a Romantic era composer (Schubert, Schumann, Chopin, Mendelssohn, and Brahms, among others) is more likely to be in ternary form. Note that these are generalities. Baroque and Classical composers wrote compositions in ternary form and Romantic composers wrote pieces in rounded binary form.

Consider the following piece by Beethoven:



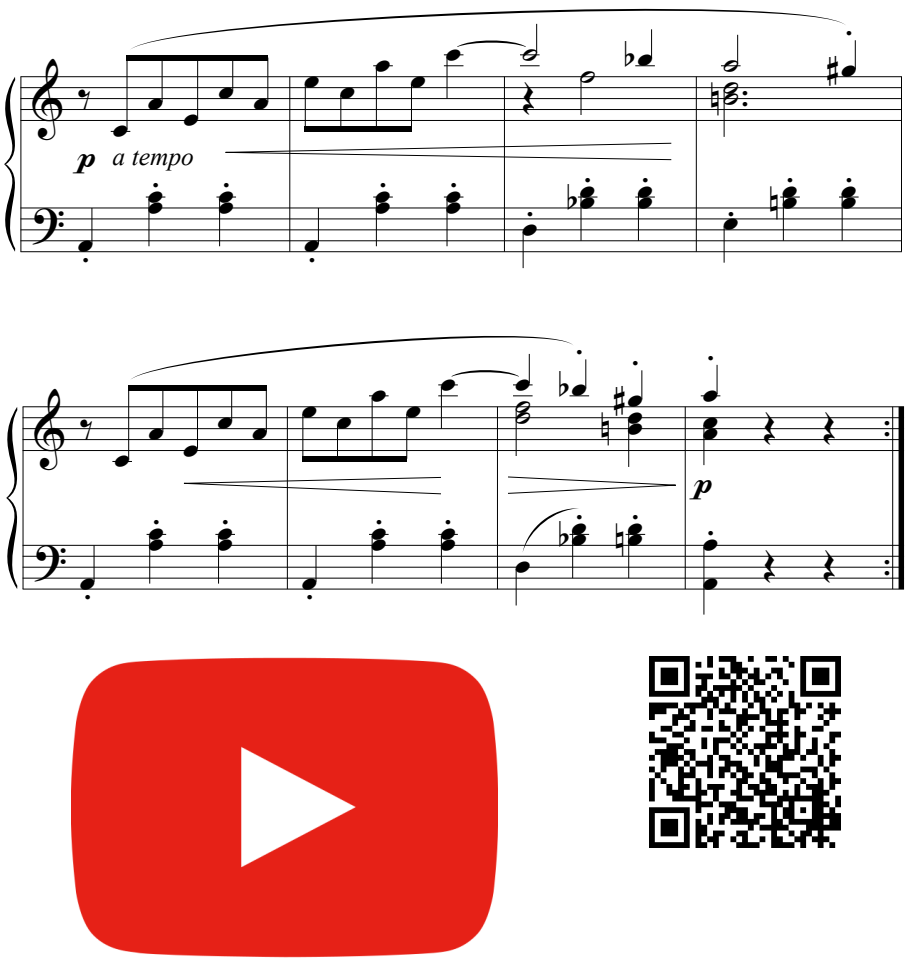


Figure 24.8.1 Beethoven, Eleven Bagatelles, Op. 119, No. 9

In terms of proportion, bars 9–12 contain contrasting material to bars 1–8. Because the contrasting material lasts for half as long as the open section, we consider the proportion as pointing toward rounded binary.

In terms of the nature of the contrasting section, the melody is built from the contour of the first four notes of the first measure, and the harmony alternates between V and I^6_4. Both the harmony and melody point us in the direction of rounded binary.

Finally, consider the era in which Beethoven lived. Is he considered a Classical or Romantic composer? This is a difficult question to answer, as Beethoven is a unique figure who is a bridge between the Classical and Romantic eras. However, it's generally safe to consider Beethoven as belonging to the Classical era, and therefore as likely to write a rounded binary form.

You will encounter examples on homework and the test where these three criteria are not unanimous and you will have to weigh the evidence to come to a conclusion.

24.8.1 Written-Out Repeats

Occasionally you will encounter an example where the repeats are written out. When you encounter such a piece, put the repeats in your diagram even though there are not in the score.

24.9 Practice Exercises

Exercise Group. Day One

1. For Handel's Gavotte, HWV 491, please fill in the blanks below the staves and diagram the form. Also, name the form. You will need to determine which notes are non-chord tones in order to determine Roman numerals.

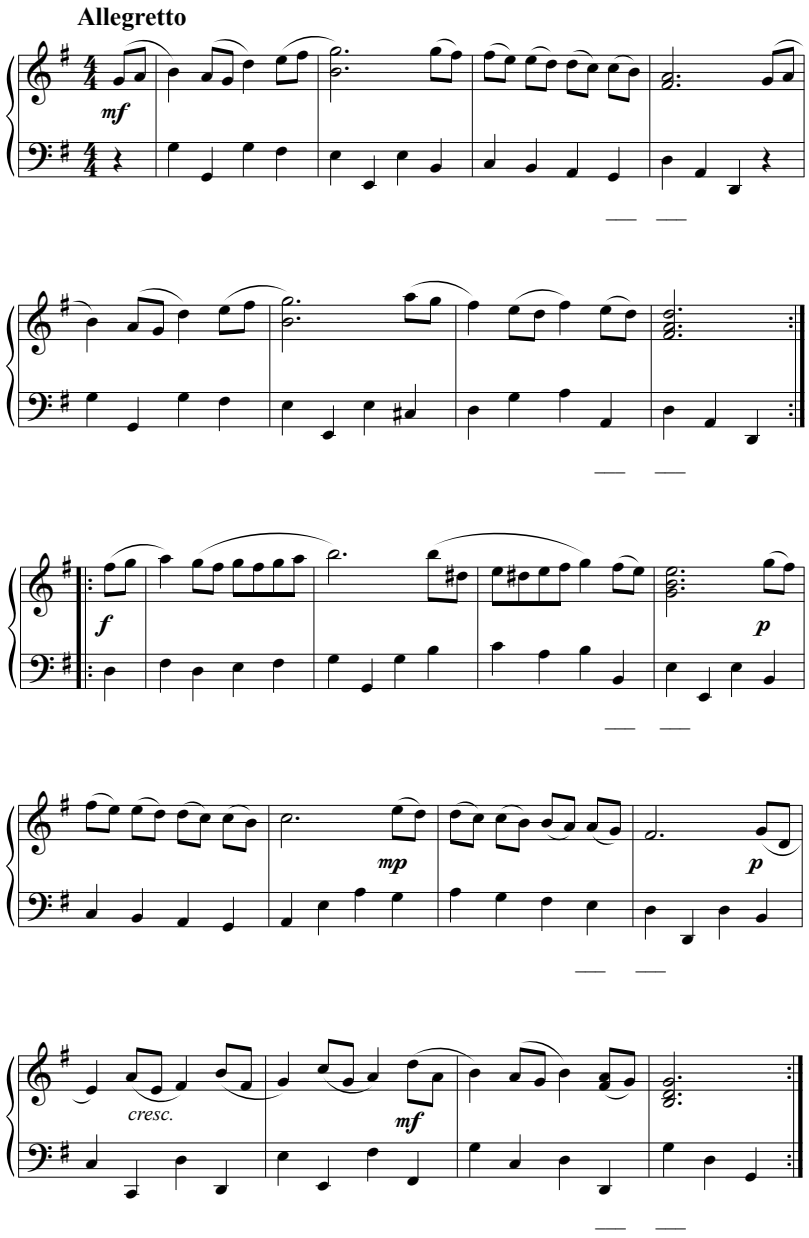


Figure 24.9.1 George Frideric Handel, Gavotte, HWV 491

For the piece above, complete the following diagram based on your analysis. Include section labels using uppercase letters, phrase labels using lowercase letters, and cadences using the abbreviations PAC, IAC, HC, DC, PC.

Circle all of the terms that apply to the name of the form:

TWO-REPRISE SECTIONAL CONTINUOUS ROUNDED BALANCED BINARY TERNARY

2. For the theme from first movement of Mozart's Piano Sonata in A major, K. 331, please fill in the blanks below the staves and diagram the form. Also, name the form.

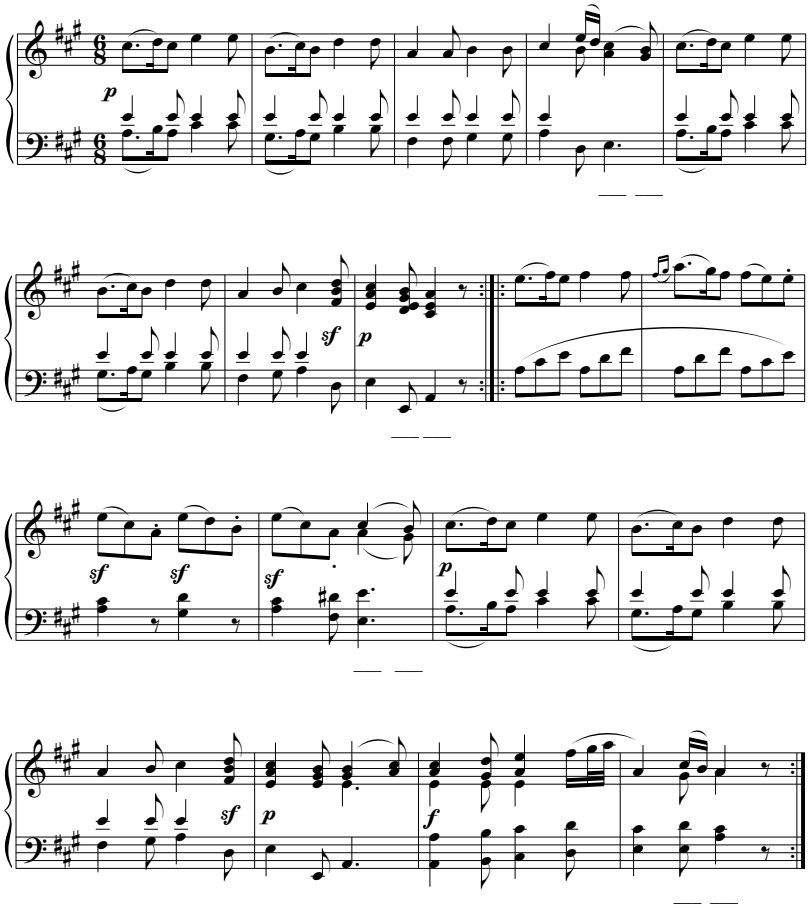
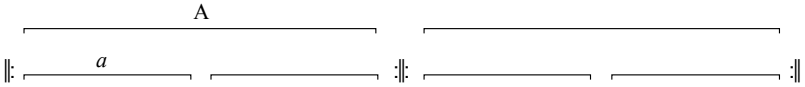


Figure 24.9.2 Mozart, Piano Sonata K. 331, I

For the piece above, complete the following diagram based on your analysis. Include section labels using uppercase letters, phrase labels using lowercase letters, and cadences using the abbreviations PAC, IAC, HC, DC, PC.



Circle all of the terms that apply to the name of the form:

TWO-REPRISE SECTIONAL CONTINUOUS ROUNDED BALANCED BINARY TERNARY

Exercise Group. Day Two

3. For this Polonaise in F major by Mozart, please fill in the blanks below the staves and diagram the form. Also, name the form.

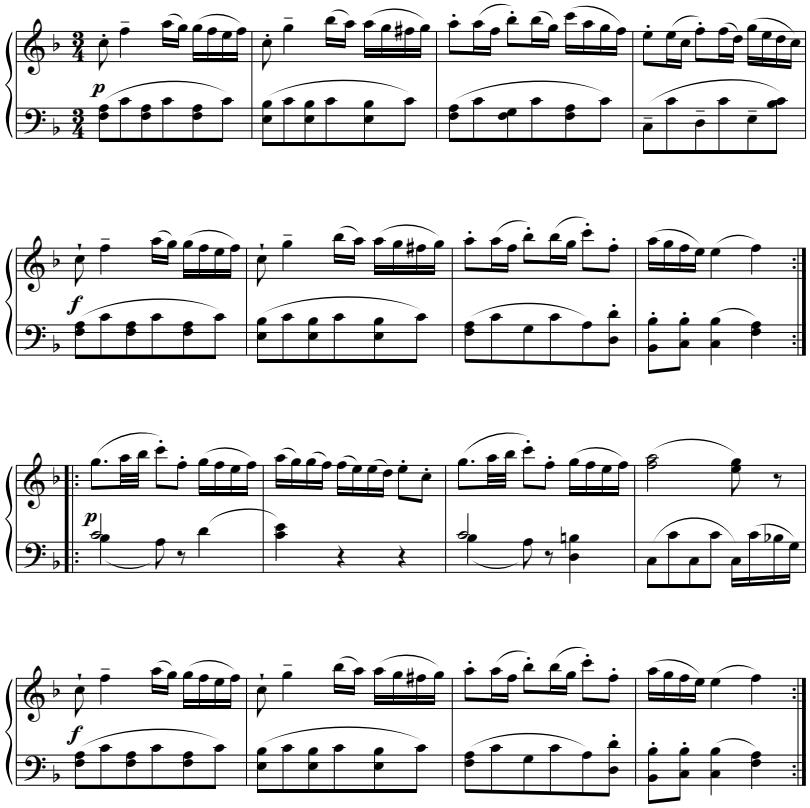
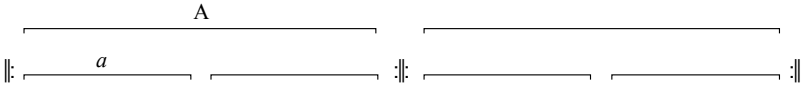


Figure 24.9.3 Mozart, Polonaise in F major

For the piece above, complete the following diagram based on your analysis. Include section labels using uppercase letters, phrase labels using lowercase letters, and cadences using the abbreviations PAC, IAC, HC, DC, PC.



Circle all of the terms that apply to the name of the form:

TWO-REPRISE SECTIONAL CONTINUOUS ROUNDED BALANCED BINARY TERNARY

4. For this Allegro in B-flat major (K. 3) by Mozart, please fill in the blanks below the staves and diagram the form. Also, name the form.

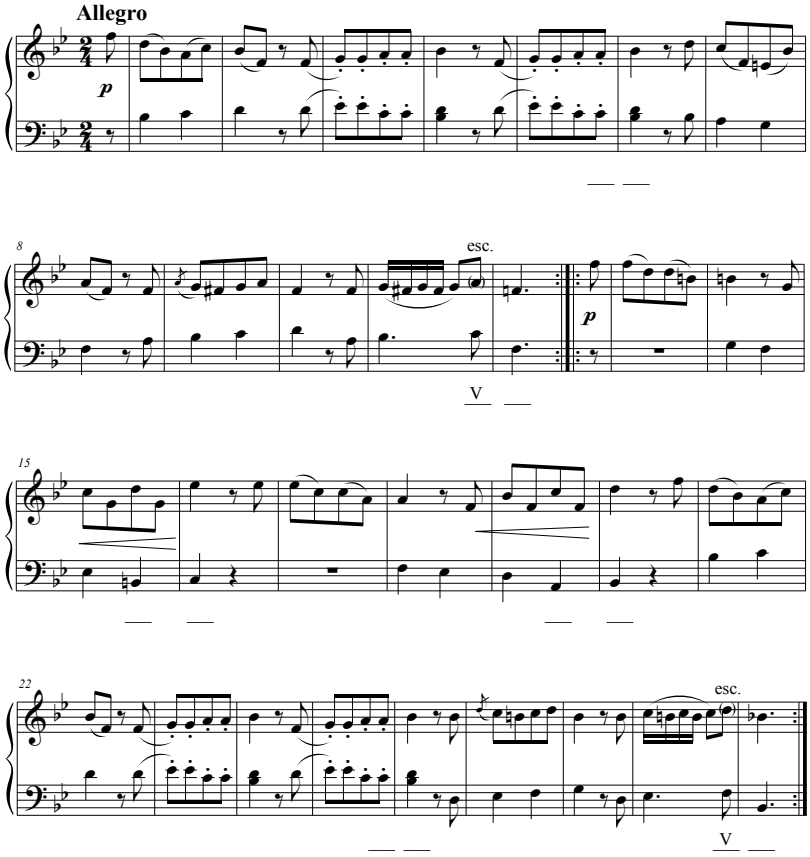


Figure 24.9.4 Mozart, Allegro in B-flat major

On scratch paper, create a diagram of the form. Include section labels using uppercase letters, phrase labels using lowercase letters, and cadences using the abbreviations PAC, IAC, HC, DC, PC.

Circle all of the terms that apply to the name of the form:

TWO-REPRISE SECTIONAL CONTINUOUS ROUNDED BALANCED BINARY TERNARY

Exercise Group. Day Three

5. Please fill in the blanks below the staves and diagram the form of "After the Ball" from Alexander Gretchaninoff's *Children's Book*, Op.98. Also, name the form.

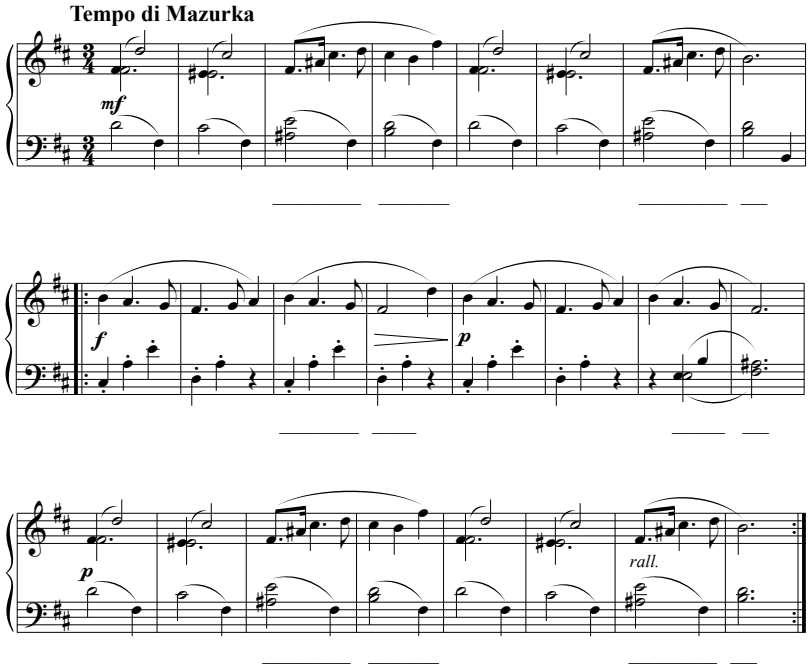


Figure 24.9.5 Gretchaninoff, *Children's Book*, Op.98, No. 13, "After the Ball"

On scratch paper, create a diagram of the form. Include section labels using uppercase letters, phrase labels using lowercase letters, and cadences using the abbreviations PAC, IAC, HC, DC, PC.

Circle all of the terms that apply to the name of the form:

TWO-REPRISE SECTIONAL CONTINUOUS ROUNDED BALANCED BINARY TERNARY

6. For the theme from Brahms's *Variations on a Theme of Haydn* Op. 56a (the theme is also known as "St. Anthony's Chorale"), please fill in the blanks below the staves and diagram the form. Also, name the form.

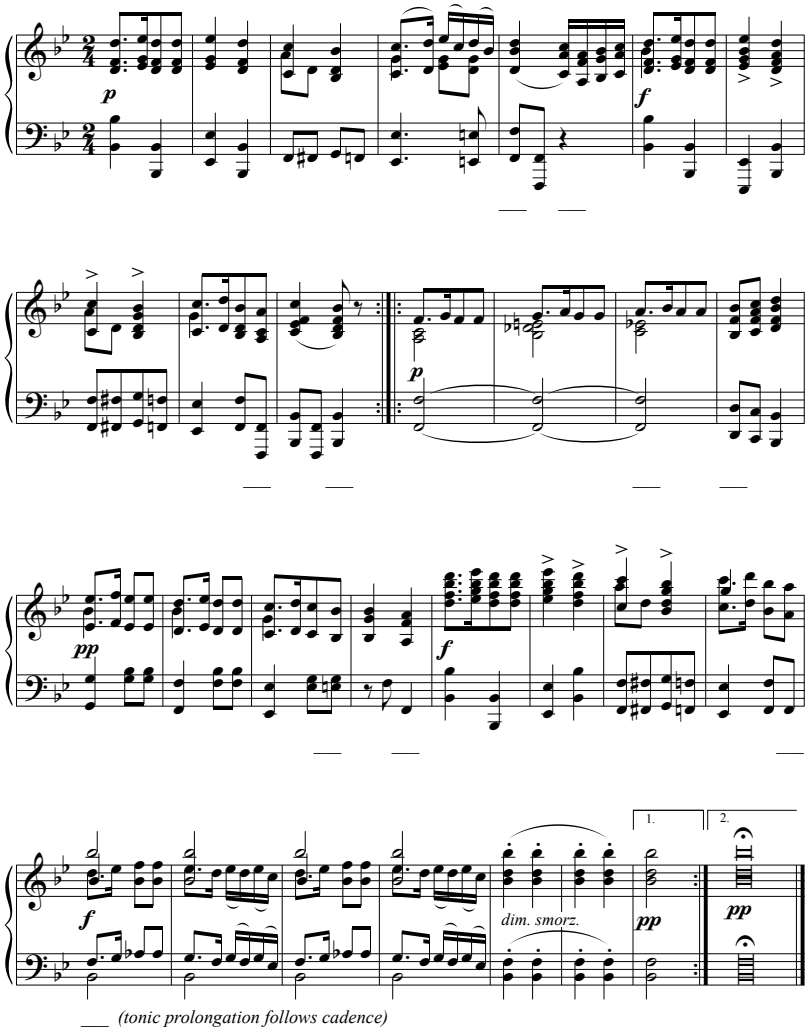


Figure 24.9.6 Brahms, *Variations on a Theme of Haydn*, Op. 56a

On scratch paper, create a diagram of the form. Include section labels using uppercase letters, phrase labels using lowercase letters, and cadences using the abbreviations PAC, IAC, HC, DC, PC.

Circle all of the terms that apply to the name of the form:

TWO-REPRISE SECTIONAL CONTINUOUS ROUNDED BALANCED BINARY TERNARY

Click here to download the first homework assignment for this chapter.

Click here to download the second homework assignment for this chapter.

Click here to download the third homework assignment for this chapter.

Click here to download the review sheet for material studied prior to this chapter.

PDF versions of the textbook, homework exercises, and practice exercises can be found at `musictheory.pugetsound.edu`

Chapter 25

Sonata and Rondo Forms

25.1 Sonata Form

Sonata form, also known as "first-movement form," is "[t]he most important principle of musical form, or formal type, from the Classical period well into the 20th century," according to the Grove Music Online. The purpose of this chapter is to serve as an introduction to formal, thematic, and harmonic aspects of sonata form. We will focus on sonata form as it existed during the height of the Classical era. Further and more detailed study of sonata form occurs in higher-level music theory courses.

25.1.1 Diagram of Sonata Form

Below is a generalized diagram of sonata form, which serves as our starting point. Real-world examples will contain differences and elaborations.

	EXPOSITION				DEVELOPMENT		RECAPITULATION			
	PT	transition	ST	(CT)	Fragmentation & sequencing	Retransition	PT	transition	ST	(CT)
In major:	I	modulating	V	V	V modulations	V pedal	I	tonicizations	I	I
In minor:	i	modulating	III	III	III modulations	V pedal	i	tonicizations	i	i

PT = Primary Theme
ST = SecondaryTheme
CT = ClosingTheme

It is fairly common for a piece in sonata form to have multiple secondary themes (ST^1, ST^2). In some sonatas, the development section features new material. Some sonatas will not have a closing theme. As we work with real world examples, you will see the ways in which composers realize sonata form.

While the diagram above designates three large sections (exposition, development, recapitulation), repeat signs in sonatas from the classical era designate the sonata as a two-reprise form—the exposition repeats, then the development and recapitulation repeat as a single unit. Douglass Green, in his book *Form in Tonal Music*, notes the sonata's evolution from and synthesis of rounded binary and balanced binary:

> The typical sonata form, as it appeared in the 18th century, is a combination of rounded and balanced binary. It begins the return with a restatement of the opening of part one, as in the rounded binary, and it closes with a restatement of the final sections (second

and closing themes) of part one transposed to the tonic, as in the balanced binary.

25.1.2 Sonatina Form

While "sonatina" is sometimes understood to mean a short sonata or an easy sonata for beginners, in terms of form, **sonatina form** is sonata form without the development section. Sonatina form is sometimes encountered in the second, slow movement of a larger work like a symphony, as well as in overtures. A familiar piece in sonatina form is the "Miniature Overture" from *The Nutcracker* by Tchaikovsky.

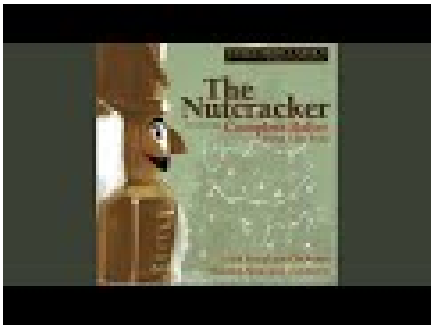


Figure 25.1.1 Tchaikovsky, *The Nutcracker*, "Miniature Overture" (1892)

Exposition			Recapitulation		
PT	ST	CT	PT	ST	CT
0:00	0:49	1:28	1:40	2:30	3:09

25.1.3 Sonata Principle

Important to sonata form is sonata principle, which Charles Rosen discusses in his book *Sonata Forms*.

> The exposition of a sonata form presents the thematic material and articulates the movement from tonic to dominant in various ways so that it takes on the character of a polarization or opposition. The essential character of this opposition may be defined as a large-scale dissonance: the material played outside the tonic (i.e., in the second group) is dissonant with respect to the center of stability, or tonic. Sonata style did not invent this concept of *dissonant section*, but it was the first style to make it the generating force of an entire movement.[1]

Rosen continues:

> The dominant is conceived as a *dissonant tonality* in the exposition....The polarization, in fact, leads to the concept of a *dissonant section*, which raises the dissonant interval or chord to a higher power: that is, a simple reintroduction of the tonic key will no longer serve as a resolution, but the section outside the tonic needs to be resolved as a whole.[2]

[1] *Sonata Forms*, Revised Edition, 1988, p. 229
[2] *Sonata Forms*, Revised Edition, 1988, p. 244

25.1.4 The Monothematic Sonata

Haydn was especially fond of restating the Primary Theme in the dominant where the Secondary Theme would normally occur. This reinforces the idea that the tonal design of a sonata was as important as thematic design.

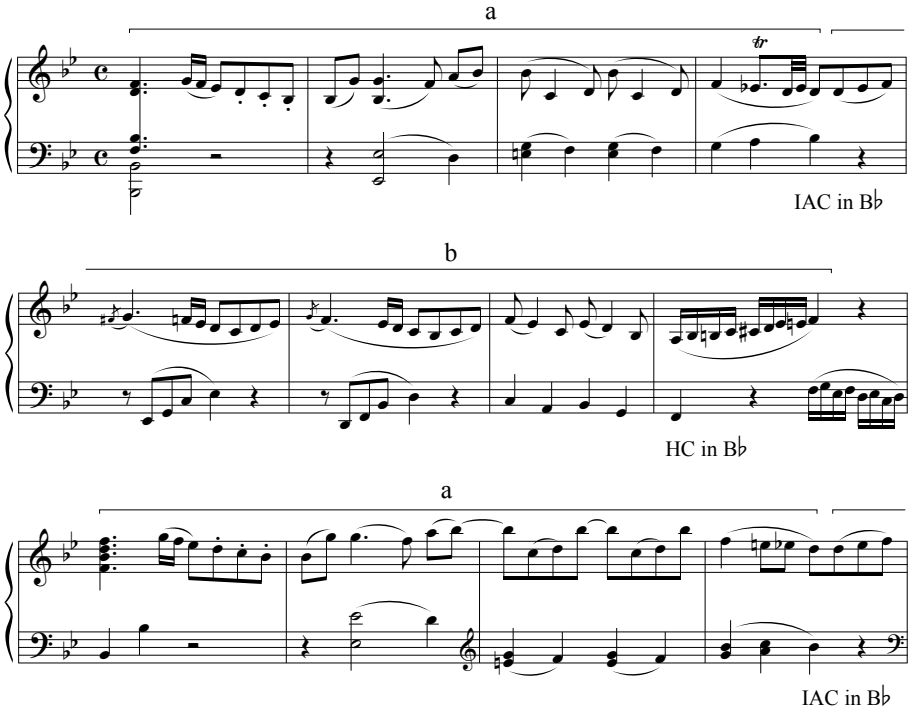
25.2 The Four Structural Functions in Music

In the "Structural Functions" chapter of *A Practical Approach to the Study of Form in Music*, Peter Temko and Peter Spencer enumerate four structural functions.

1. Expository function
2. Transitional function
3. Developmental function
4. Terminative function

25.2.1 Expository Function

Music expressing **expository function** maintains a stable tonal center and clear melodies, usually with well-defined phrases. The vast majority of the music we encountered in binary and ternary form in the last chapter was expository in nature. Additionally, the primary and secondary themes in a sonata form are usually have expository function. Below is the secondary theme from the first movement of Mozart's Piano Sonata, K. 333.



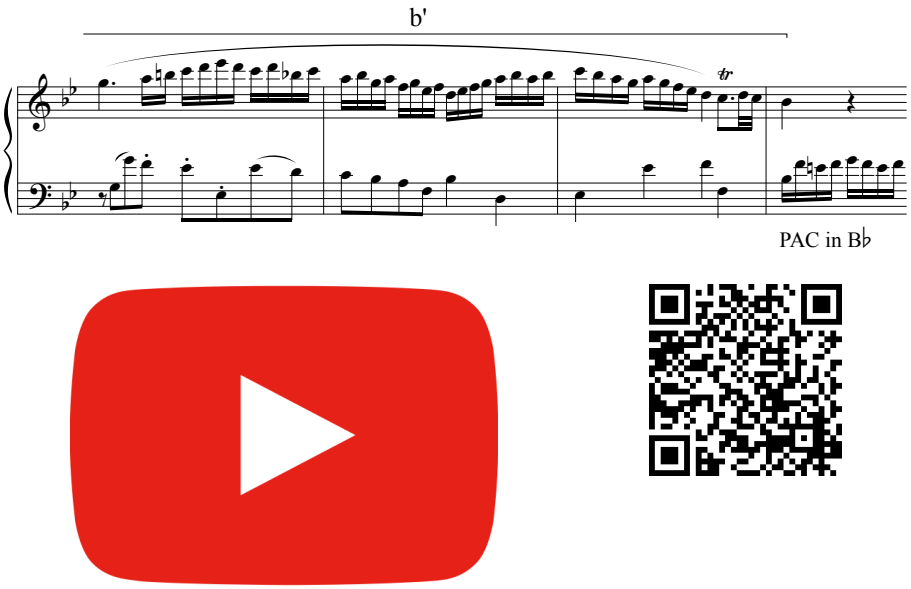
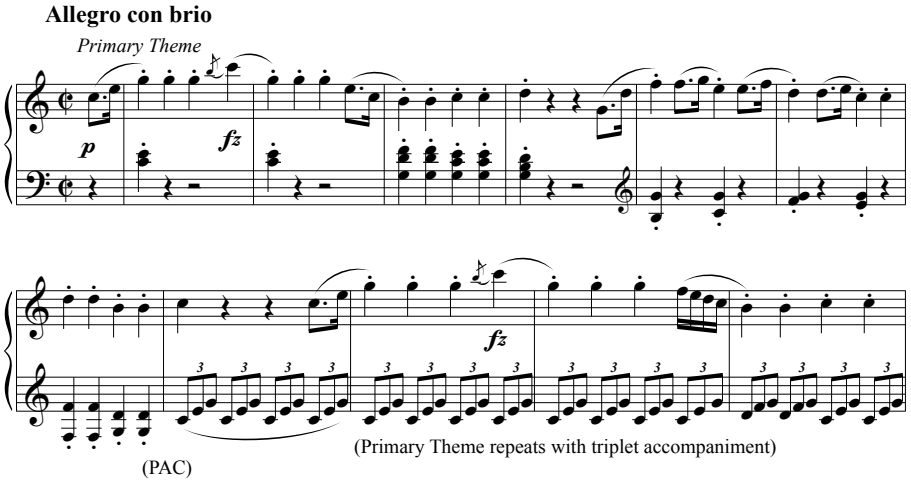


Figure 25.2.1 Mozart, Piano Sonata, K. 333, I, Secondary Theme

Notice the perfect authentic cadence that closes off this four-phrase parallel double period within the larger sonata form. Cadences are important demarcations within a form.

25.2.2 Transitional Function

Music of **transitional function** moves from one tonal center to another and often features a contrasting accompanimental texture more rhythmically active than preceding expository material. Tonicizations may also occur within a transition. Transitions are sometimes called bridges. Mozart and Haydn often ended their sonata form transitions with a half cadence followed by a rest to signal that the secondary theme was about to commence. Again, notice the importance of cadences to demarcate the form.



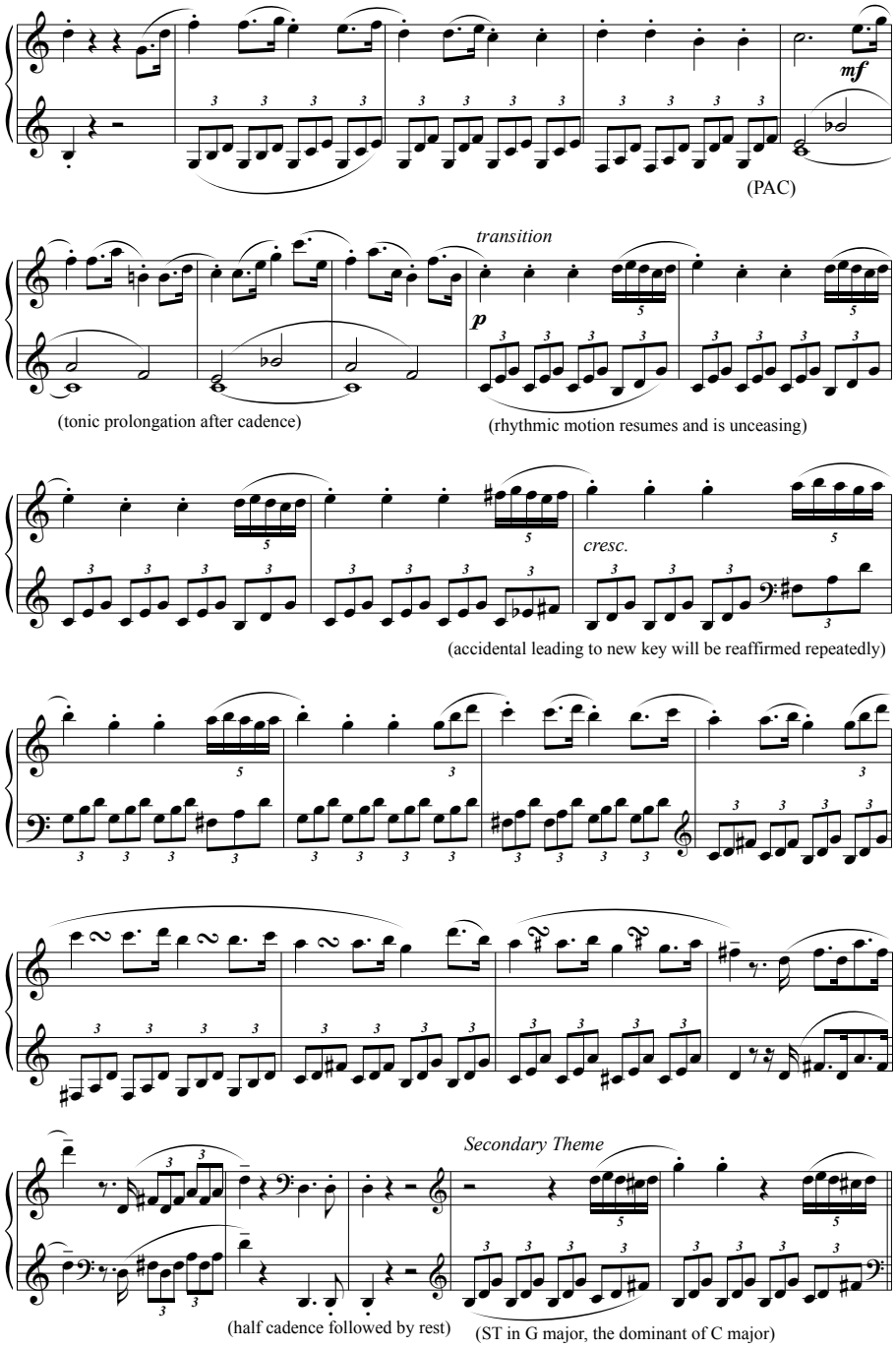

mf
(PAC)
transition
p
(tonic prolongation after cadence)
(rhythmic motion resumes and is unceasing)
cresc.
(accidental leading to new key will be reaffirmed repeatedly)
Secondary Theme
(half cadence followed by rest)
(ST in G major, the dominant of C major)

Figure 25.2.2 Joseph Haydn, Piano Sonata in C major, Hob. XVI:35, I.

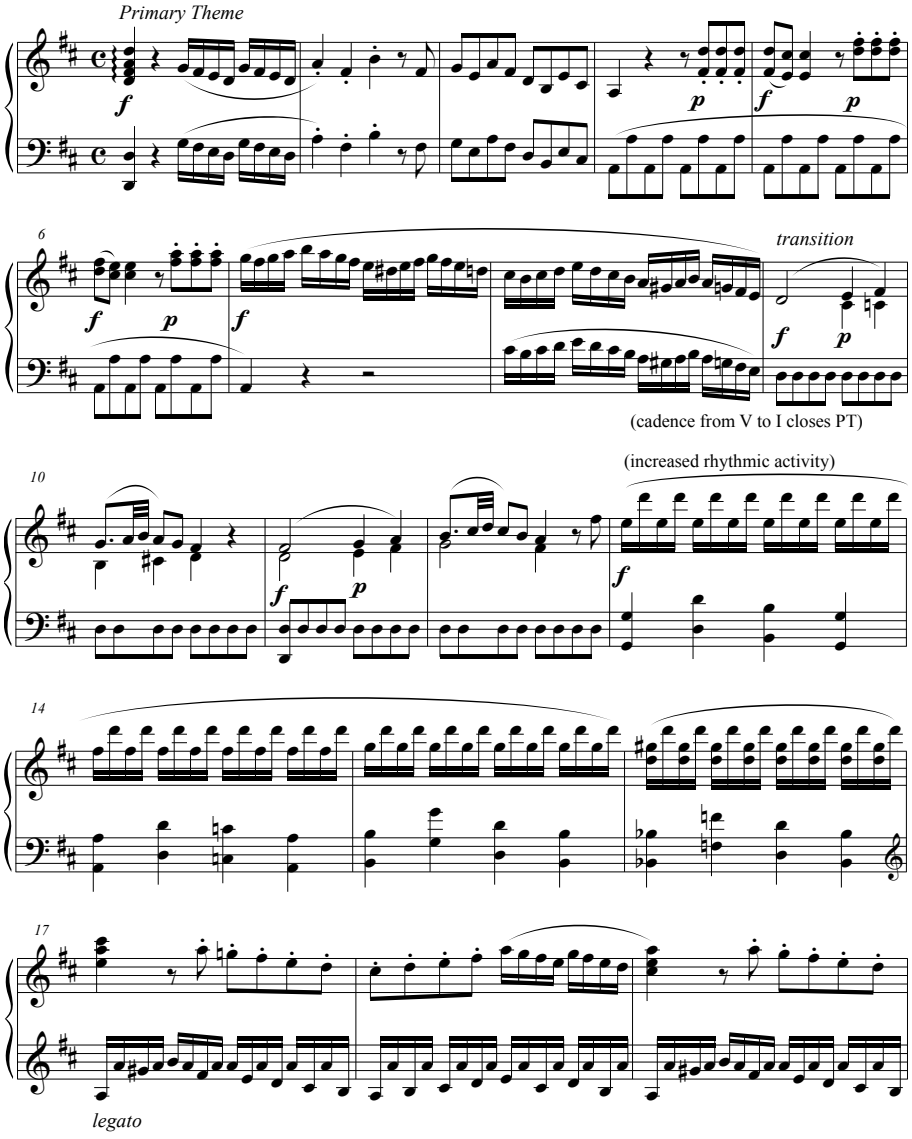


Figure 25.2.3 Mozart, Piano Sonata, K. 284, I.

25.2.3 Developmental Function

Music with **developmental function** often contains sequences and fragmentation of earlier melodies. In addition, developmental music modulates through multiple keys. Phrase lengths may be irregular and elisions may be used by the composer to keep the listener off balance.

It can sometimes be difficult to distinguish between transitional and developmental music. A development section is typically longer than a transition and therefore will contain more sections of a varying nature and as well as a greater number of modulations.

Examples from a development section can be found in Section 11.1 of this text. Note the fragmentation and sequencing of melodic ideas as well as the different keys expressed in the examples throughout that section.

25.2.4 Terminative Function

Terminative function is typically expressed through a rather emphatic alternation of tonic and dominant harmonies, usually to affirm a tonal center. The closing theme of a sonata has terminative function.

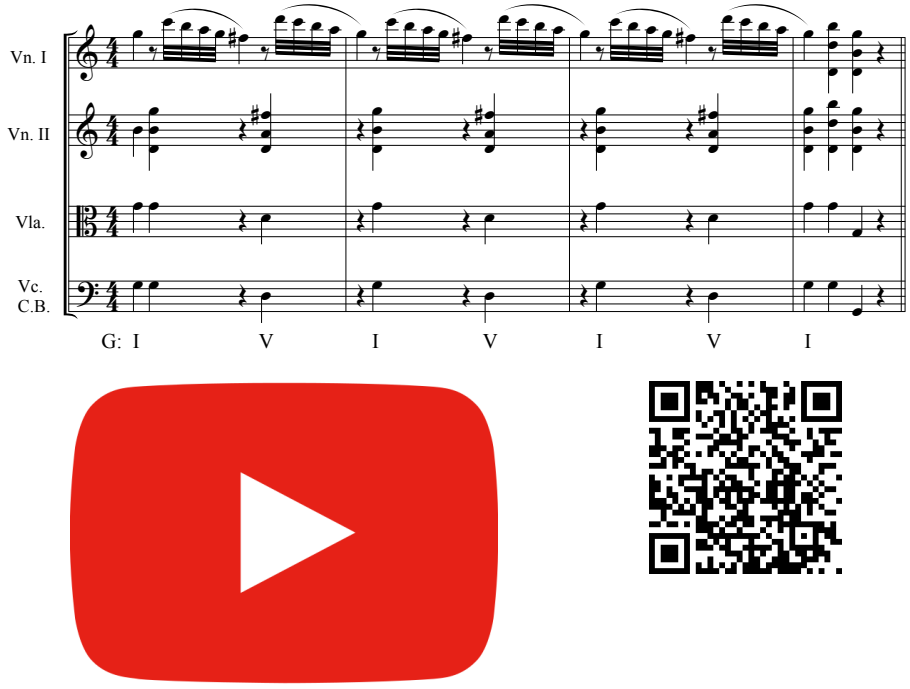


Figure 25.2.4 Mozart, Symphony No. 41, K. 551, I., Closing Theme

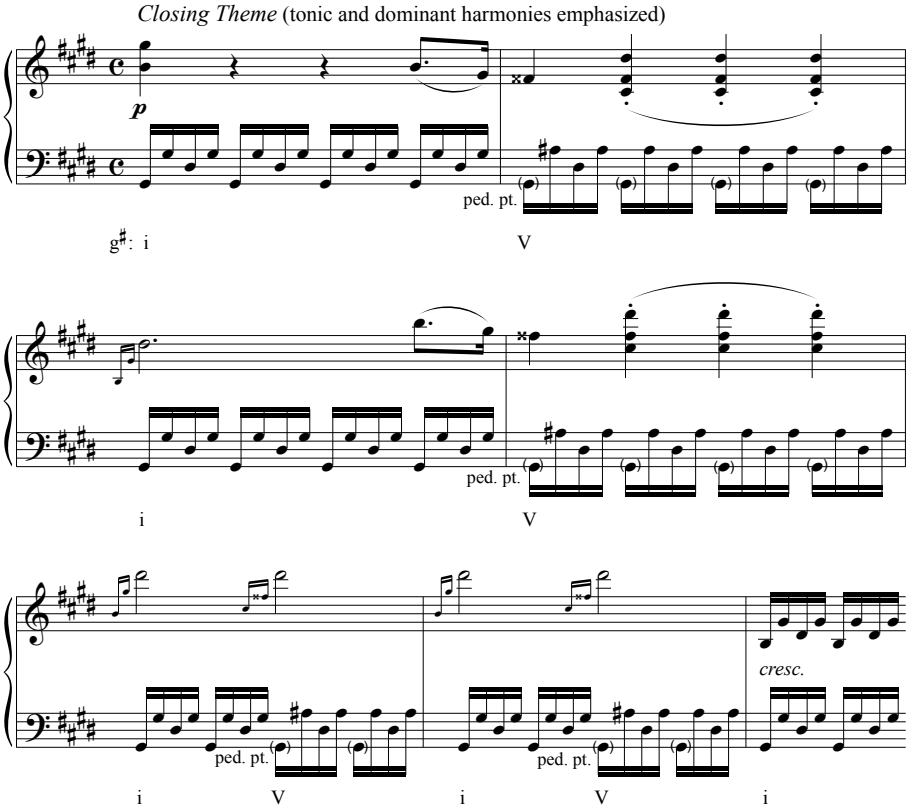


Figure 25.2.5 Beethoven, *Moonlight Sonata*, Op. 27, No. 2, III, Closing Theme (1802)

Go to the Practice Exercises at the end of this chapter to practice identifying these four structural functions aurally.

25.3 Rondo Form

A **rondo** is a piece that begins with a refrain (an A section) that alternates with episodes (B and C). The 5-part rondo, an example of which we encountered in an earlier chapter, has ABACA form or ABABA form. The 7-part rondo typically has ABACABA form, although other designs exist. A diagram for 7-part Classical form is shown below.

	A	transition	B	retransition	A	transition	C	retransition	A	transition	B	retransition	A
Major:	I		V		I		i,vi, or IV		I		I		I
Minor:	i		III		i		I,VI, or iv		i		i		i

The refrain (the A section) is always in tonic. The first episode (the B section) was typically in a closely related key—the dominant (V) if in major or the mediant (III) if in minor. There was greater variety of keys used for the second episode (the C section), including tonic minor in a major sonata or the submediant (vi or VI). A retransition in this case is defined as a transition returning to material previously heard.

Note that the B section being first stated in the dominant then later in tonic is an example of sonata principle, a principle which occurred in many Classical era pieces (see Charles Rosen's *Sonata Forms* for more on sonata principle).

An example of Classical seven-part rondo form is found below in the third and final movement of Beethoven's Pathétique Sonata, Op. 13.

Figure 25.3.1 Beethoven, Pathétique Sonata, Op. 13, III (1798), Refrain

A brief sequential transition follows, leading to the mediant (E♭ major).

Figure 25.3.2 Beethoven, Pathétique Sonata, Op. 13, III, Transition

The first episode (the B section) is in the mediant, Eb major, the relative major of C minor. The primary purpose of this first episode to establish a key different than the starting key. Notice that the themes during this episode are not particularly tuneful.

Figure 25.3.3 Beethoven, Pathétique Sonata, Op. 13, III, First Episode

The final melody of the first episode is clearly in the form of a parallel period.

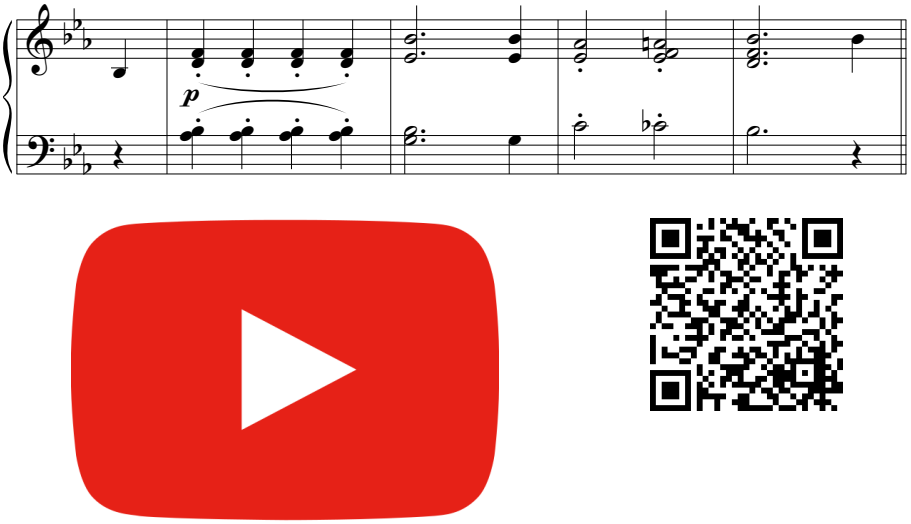


Figure 25.3.4 Beethoven, Pathétique Sonata, Op. 13, III, Conclusion of First Episode

A retransition follows and leads to a half cadence on a G major chord. The refrain follows in C minor.

Figure 25.3.5 Beethoven, Pathétique Sonata, Op. 13, III, Retransition to Second Refrain

The second episode (the C section) follows immediately after the refrain. The second episode is in A♭ major, the submediant (VI) of C minor.

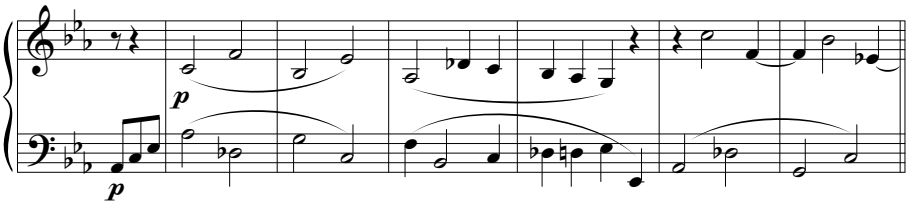


Figure 25.3.6 Beethoven, Pathétique Sonata, Op. 13, III, Second Episode

A retransition follows the second episode, ending on a half cadence on G major.

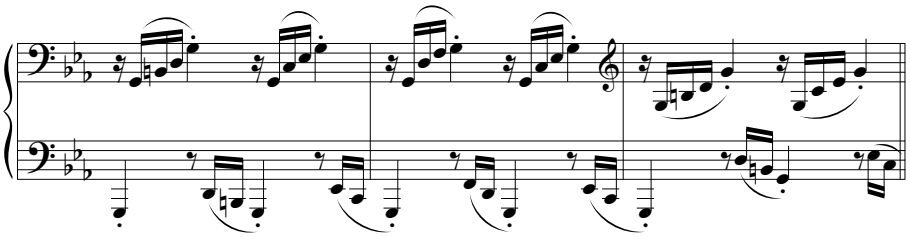


Figure 25.3.7 Beethoven, Pathétique Sonata, Op. 13, III, Retransition to Third Refrain

An abbreviated version of the refrain follows, leading directly to a restatement of the second episode (the B section), this time in tonic major (C major).

Figure 25.3.8 Beethoven, Pathétique Sonata, Op. 13, III, Third Refrain and Second Episode restated in tonic

Following the Second Episode is brief retransition that develops final motives of that episode through sequences.

Figure 25.3.9 Beethoven, Pathétique Sonata, Op. 13, III, Retransition to Final Refrain

After one last statement of the refrain in C minor, the Coda begins immediately after the cadence closing the refrain.

Figure 25.3.10 Beethoven, Pathétique Sonata, Op. 13, III, Final Refrain

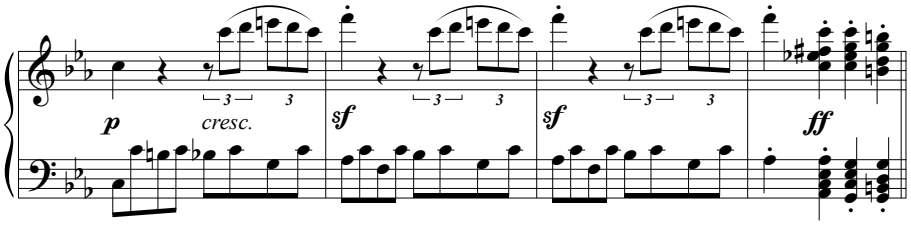


Figure 25.3.11 Beethoven, Pathétique Sonata, Op. 13, III, Coda

To review a simple, five-part rondo form, see the section on the second movement of *Eine kleine nachtmusik* in the chapter on Creating Contrast Between Sections.

25.3.1 Sonata Rondo Form

Sonata rondo form is a rondo in which the second episode (the C section) is replaced by a development section, resulting in a design of A-B-A-Dev.-A-B-A.

25.4 Rondo Character

Rondo character is characterized by quick tempo in duple meter with light character, typically achieved through the use of staccato articulation. This duple meter could be either simple ($\frac{2}{4}$) or compound ($\frac{6}{8}$). During the Classical era, the final movement of a multi-movement composition, e.g. a sonata, quartet, or symphony, was often in rondo character. Not all pieces in rondo form are in rondo character.

Listen to the following seven examples to develop familiarity with rondo character.

1. **Figure 25.4.1** Joseph Bologne, Chevalier de Saint-Georges, Violin Concerto No. 9 in G major, Op. 8, III.

2. **Figure 25.4.2** Haydn, Piano Sonata in D major, H. XVI:37, III.

3. **Figure 25.4.3** Haydn, Symphony No. 104 in D major, Hob. I:104, IV.

4. **Figure 25.4.4** Haydn, String Quartet in E-flat major, Op. 33, No. 2, IV.

5. **Figure 25.4.5** Mozart, Symphony No. 36 in C major, K.425, IV.

6. **Figure 25.4.6** Mozart, Symphony No. 39 in E-flat major, K.543, IV.

7. **Figure 25.4.7** Mozart, String Quartet No. 19 in C major, K.465, IV.

25.5 Standard Forms in a Multimovement Classical Piece

Below are the forms commonly encountered in the various movements of Classical symphonies, string quartets, and sonatas.

1. First movement: Sonata form
2. Second movement: Ternary form (ABA), sonatina form, or five-part rondo
3. Third movement: Minuet and Trio (Compound Ternary)
4. Fourth movement: Rondo form, sonata form, or sonata rondo form

25.6 Practice Exercises

Exercise Group.

1. Identify the structural function of each excerpt below as expository, transitional, developmental, or terminative. Aurally identify the tonic and determine if the key is maintained or if other keys occur. Listen for cadences to demarcate the form.

(a) Haydn, Piano Sonata No. 59 in E-flat major, Hob. XVI:49, I.

(b) Beethoven, Symphony No. 5 in C Minor, Op. 67, I.

(c) Mozart, Piano Sonata No. 18 in D major, K.576, I.

(d) Mozart, Symphony No. 40 in G Minor, K. 550, I.

(e) Mozart, Piano Sonata No. 7 in C major, K. 309, I.

(f) Haydn, Symphony No. 104 In D major, Hob. I:104, I.

(g) Mozart, Piano Sonata No. 7 in C major, K. 309, I.

(h) Mozart, Piano Sonata No. 18 in D major, K.576, I.

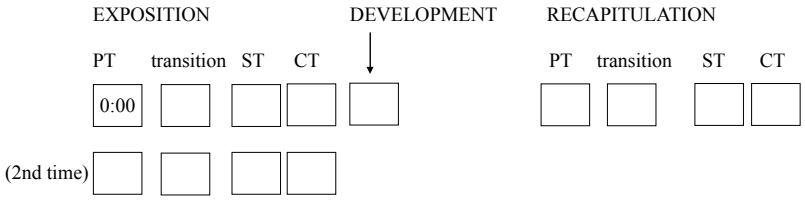
(i) Mozart, Piano Sonata No. 8 in A minor, K. 310, I.

(j) Haydn, Piano Sonata No. 60 in C major, Op. 79, Hob. XVI:50, I.

(k) Mozart, Piano Sonata No. 14 in C Minor, K. 457, I.

(l) Mozart, Symphony No. 40 in G Minor, K. 550, IV.

2. Listen to the pieces below and fill in the diagrams. Cadences and textural changes will designate the form—listen carefully for these.



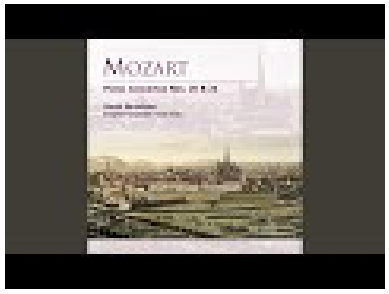


Figure 25.6.1 Mozart, Piano Sonata K. 545, I.

Figure 25.6.2 Mozart, *Eine kleine nachtmusik*, K. 525, I.

Exercise Group. Examples for Assignment 36, Section 1

3. For each excerpt below, identify the structural function as either expository, transitional, developmental, or terminative.

(a) Haydn, Piano Sonata No. 59 in E-flat major, Hob. XVI:49, I.

(b) Mozart, Piano Sonata No. 7 in C major, K. 309, I.

(c) Beethoven, Symphony No. 5 in C Minor, Op. 67, IV.

(d) Mozart, Piano Sonata No. 8 in A Minor, K. 310, I.

(e) Mozart, Piano Sonata No. 14 in C Minor, K. 457, I.

(f) Haydn, Symphony No. 104 in D major, Hob.I:104, IV.

(g) Mozart, String Quartet No. 17 In B-flat, K.458, IV.

(h) Mozart, Piano Sonata No. 18 in D major, K.576, I.

(i) Mozart, Piano Sonata No. 8 in A minor, K. 310, I.

(j) Haydn, Piano Sonata No. 60 in C major, Hob. XVI:50, I.

(k) Mozart, String Quartet No. 17 In B-flat, K.458, IV.

(l) Mozart, Piano Sonata No. 14 in C Minor, K. 457, I.

Click here to download the first homework assignment for this chapter.
Click here to download the second homework assignment for this chapter.
Click here to download the Unit 7 Practice Test.

Chapter 26

Voice Leading Triads

26.1 Voice Leading

Voice leading, also known as part writing, refers to rules about melodic motions of voices involved in harmonic progressions. The primary concerns behind voice leading rules are independence of parts, voicing of chords, and economy of melodic motion for the sake of singable parts.

"SATB" voice leading refers to four-part chords scored for soprano (S), alto (A), tenor (T), and bass (B) voices. Three-part chords are often specified as SAB (soprano, alto, bass) but could be scored for any combination of the three voice types. SATB voice leading will also be referred to as "chorale-style" voice leading.

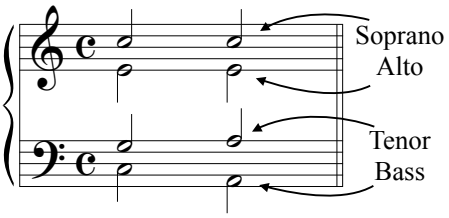


Figure 26.1.1 Soprano, Alto, Tenor, and Bass voices on the grand staff in "chorale-style" voice leading

"Piano-style" voice leading means the three upper parts are in the upper staff (the right hand part) and the bass is the only voice in bass clef (the left hand part).

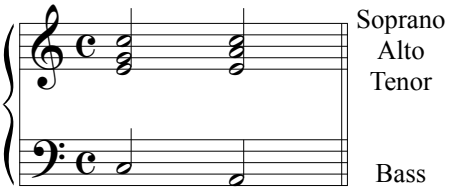


Figure 26.1.2 "Piano-style" voice leading

26.2 Types of Motion

Definitions must be set out regarding types of motion between two parts.

- ***Contrary motion*** occurs when the two voices move in opposite direction to each other by step or leap.
- ***Oblique motion*** occurs when one voice stays the same and the other voice moves up or down by step or leap.
- ***Similar motion*** occurs when both voices move in the same (or "similar") direction—both up (by step or leap) or both down (by step or leap); similar motion is also called "direct" motion
- ***Parallel motion*** is a specific type of similar motion and occurs when both voices move in the same direction by the same interval—both up by step, or both down by a third.

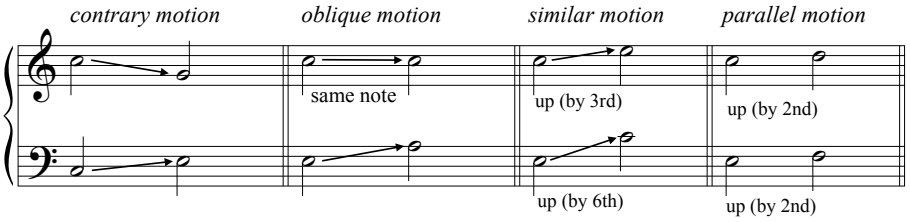


Figure 26.2.1 The four types of motion

26.3 Objectionable Parallels

When writing in three or four parts, avoid having any two voices move in parallel fifths or parallel octaves (and their octave equivalents—parallel twelfths and parallel unisons). In the Renaissance, Baroque, Classical, and Romantic eras, these objectional parallels were thought to destroy the independence of the voices. Parallel 3rds, 4ths, and 6ths were considered acceptable. Parallel 2nds and 7ths generally were not used.

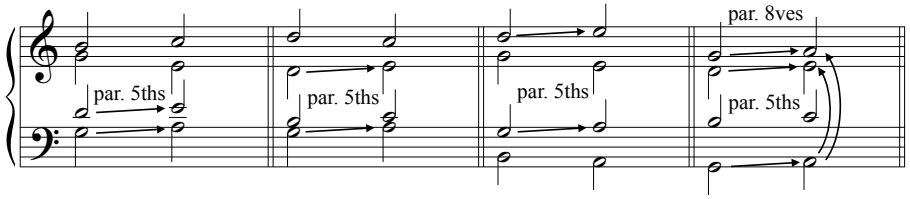


Figure 26.3.1 Objectionable parallel fifths and parallel octaves

26.4 Voice Ranges

For the purpose of music theory class, we will set out restrictions for voice ranges that are likely more limited than those found among vocalists in the class. These voice ranges are based on those most commonly found in J.S. Bach's *371 Chorales*.

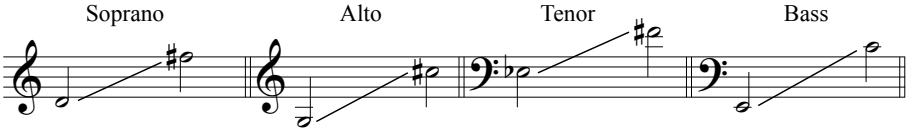


Figure 26.4.1 Voice ranges for soprano, alto, tenor, and bass voices

26.5 Rules of Melody

Rules of melody have been included in books on composing, writing counterpoint, and music theory for centuries. The purpose of the rules of melody as described in this text are to aid in the construction of singable melodies and to reflect a summary of melodic practice in music. (Remember that each part in an SATB composition is considered a melody.) Because these rules of melody are based stylistically on the melodies found in J.S. Bach's *371 Chorales*, you will no doubt be familiar with exceptions that have occurred in music composed since Bach's death in 1750.

1. **Tendency tones** (scale degrees $\hat{2}$, $\hat{4}$, $\hat{6}$, and $\hat{7}$) should resolve: $\hat{7}$ goes to $\hat{8}$ and, to a lesser extent, $\hat{4}$ goes to $\hat{3}$ (scale degrees $\hat{6}$ and $\hat{2}$ both should resolve down by step)
2. Avoid augmented intervals
3. Leaps larger than a 4th and leaps of diminished intervals should change direction after the leap
4. Consecutive leaps should outline a triad

The following example demonstrates how difficult a melody can be to sing when these rules are broken

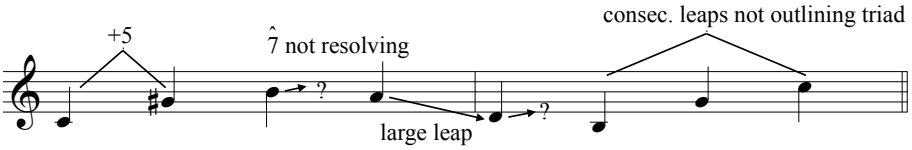


Figure 26.5.1

26.6 Rules of Spacing

Generally, the upper three voice parts (soprano, alto, and tenor) are kept close together. The general rule of spacing is to keep the distance between soprano and alto as well as the distance between alto to tenor within an octave of each other. Allowing a distance greater than an octave between soprano and alto (or between alto and tenor) is considered **spacing error**. The distance from the bass to the tenor can be greater than an octave.

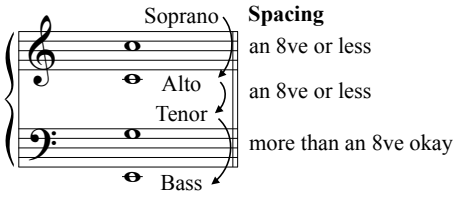


Figure 26.6.1

In terms of spacing chords, one should consider the spacing that occurs in the **overtone series**.

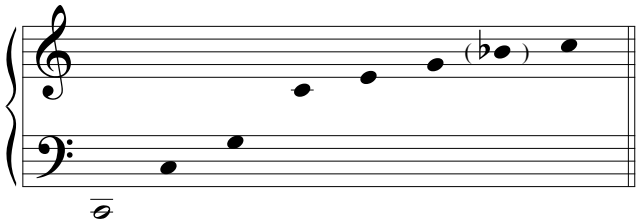


Figure 26.6.2 Overtone series starting on C2

Larger spaces between notes occur lower in the overtone series. Consider the voicings of the following chords. Some "ring" or resonate better than others. Notice that all of the notes fall within the voice ranges specified above.

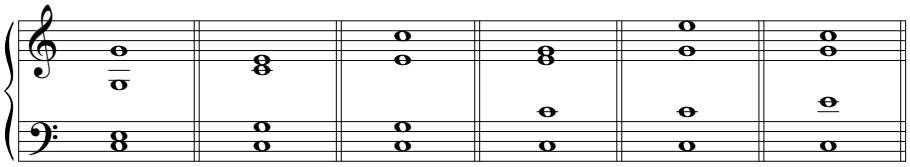


Figure 26.6.3

26.7 Voice Leading Root Position Triads in Four Parts

We are writing in four parts but triads have three notes. We will double the root of every root position chord. (The root is in the bass when a triad is in root position, so we are doubling the bass note in an upper part.)

Principle 26.7.1 Doubling rule for root position triads. *Always double the root in root position triads.*

To move from one chord to the next, consider the interval that occurs melodically in the bass line between the current chord and subsequent one.

26.7.1 Bass movement of the interval of a 3rd or 6th

In the upper three parts (soprano, alto, and tenor): retain the two common tones and move the other voice by step

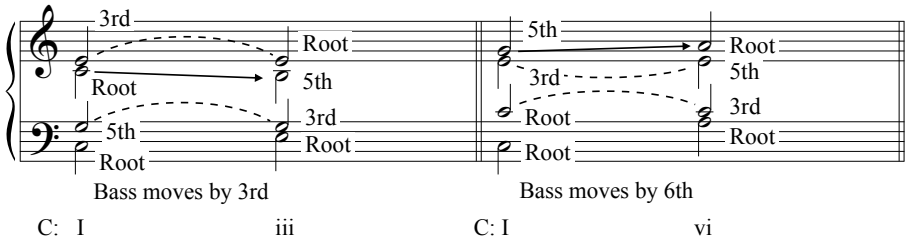
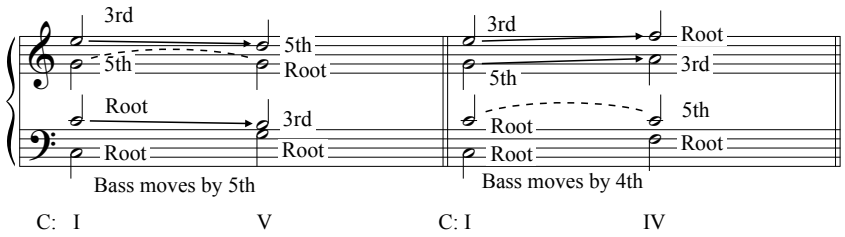


Figure 26.7.2

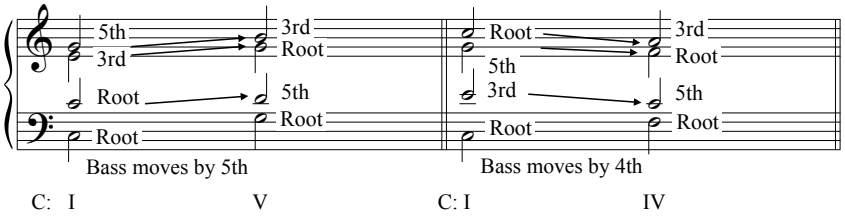
26.7.2 Bass movement of the interval of a 4th or 5th

In the upper three parts, do one of the following:

1. Retain the common tone and move the other two voices by step



2. Move all of the upper voices in the same direction (each upper voice will move by a 2nd or 3rd to the nearest chord member in the second chord)



26.7.3 Bass movement of the interval of a 2nd

Move the three upper parts in contrary motion to the bass line.

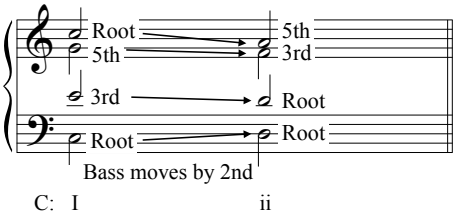


Figure 26.7.3

There is one exception, which leads us to the following principle:

Principle 26.7.4 Voice leading the deceptive progression. *When the bass moves by the interval of a 2nd in the deceptive progression in the minor mode (V–VI in C minor),* always *move the 3rd of the V chord up by step while the other notes (the 5th and the doubled root) move in contrary motion to the bass.*

In this situation, two voices move in an upward direction and two voices move in a downward direction. This results in a doubled 3rd in the VI chord. In the major mode, use this voice-leading solution if $\hat{7}$ is in the soprano voice (because it is a tendency tone—see Item 1 in Section 26.5).

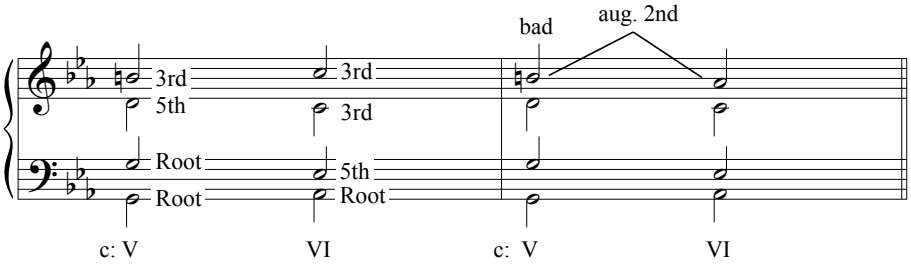


Figure 26.7.5 Voice leading the deceptive progression in minor

The following two examples demonstrate the two possible ways to deal with the deceptive progression in the major mode.

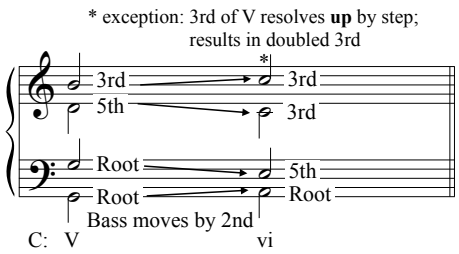


Figure 26.7.6 $\hat{7}$ in the soprano voice in the deceptive progression in major

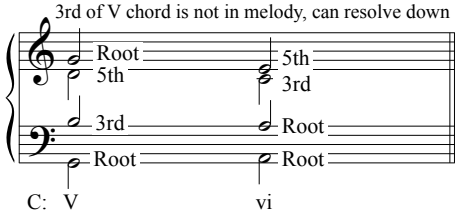


Figure 26.7.7 $\hat{7}$ in an inner voice in the deceptive progression in major

26.7.4 Repetition of the bass note

Repeat the upper three notes or arpeggiate the upper notes to different chord members while maintaining the voicing of a doubled the root, one 3rd and one 5th.

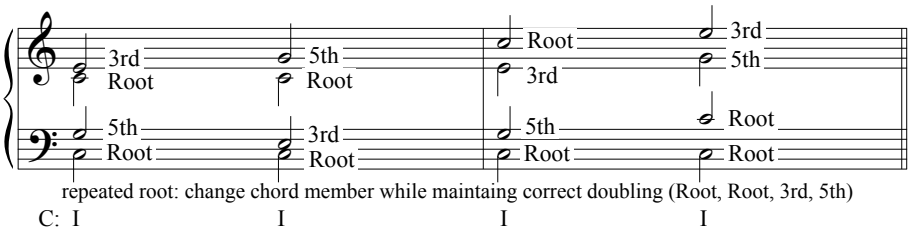


Figure 26.7.8 Repeated notes in the bass line

26.8 Voice Leading First-Inversion Triads

Instead of focusing on the intervallic distance the bass part travels between roots of chords, voice leading first inversion triads requires focusing on the doubling or voicing of the chord itself. When approaching or leaving a first inversion chord, move as smoothly as possible while avoiding objectionable parallels, spacing errors, and melodic errors.

26.8.1 Voicing a First Inversion Chord

In contrast to the doubling rule for root position chords (i.e., "double the bass"), do *not* double the bass note for first inversion triads. Instead, double the root or fifth, depending on which can be approached and left most smoothly.

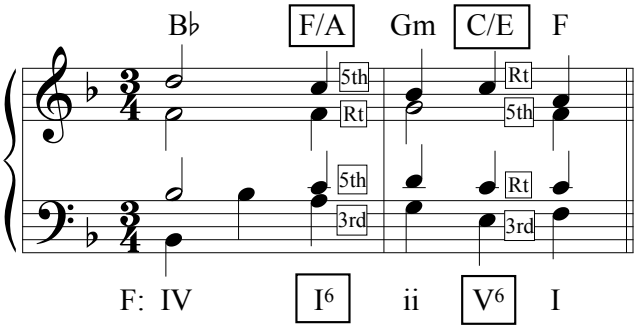


Figure 26.8.1 J.S. Bach, Chorale 237, "Gott lebel noch", BWV 320

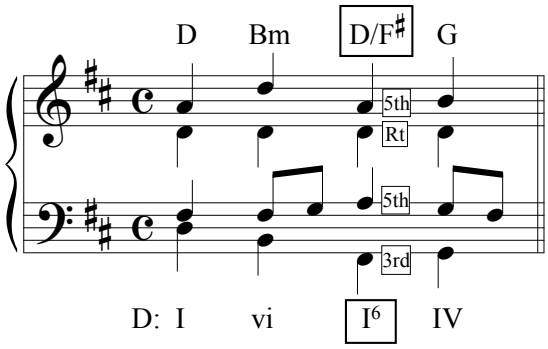


Figure 26.8.2 J.S. Bach, Chorale 153, "Alle Menschen müssen sterben", BWV 262

If the 3rd of a first inversion *is* doubled, it will be in one of the following situations:

1. Diminished triads in first inversion—always double the third (the bass), not the root or fifth

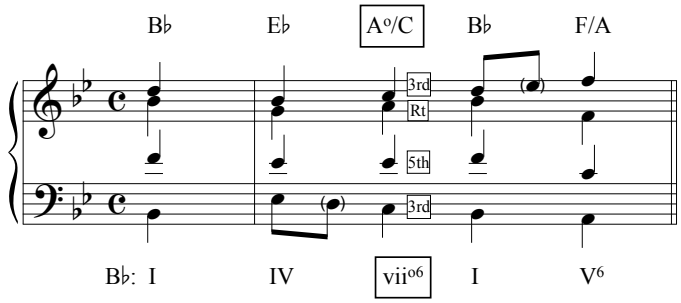


Figure 26.8.3 J.S. Bach, Chorale 103, "Nun ruhen alle Wälder", BWV 392

2. Consecutive first inversion chords—alternate between doubling the third and not doubling the third

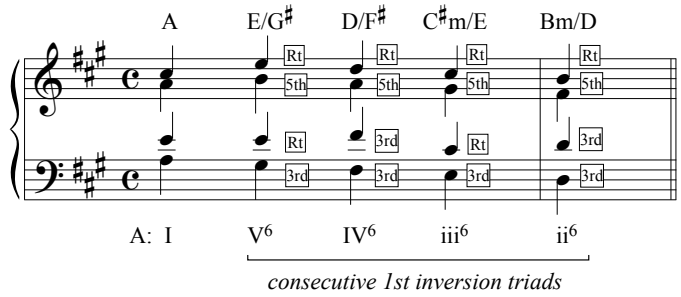


Figure 26.8.4 J.S. Bach, Chorale 106, "Jesu Leiden, Pein und Tod", BWV 245

3. Approached in opposite direction in both parts

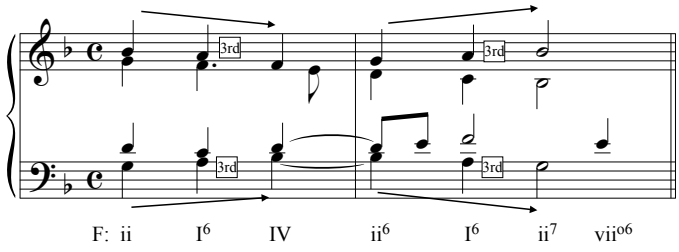


Figure 26.8.5 Palestrina, *Missa Aeterna Christi Munera*, Sanctus

Note that you should never double the third of the V chord because it is the leading tone ($\hat{7}$).

26.9 Voice Leading Second Inversion Triads

When a triad is in second inversion, double the fifth (the bass note).

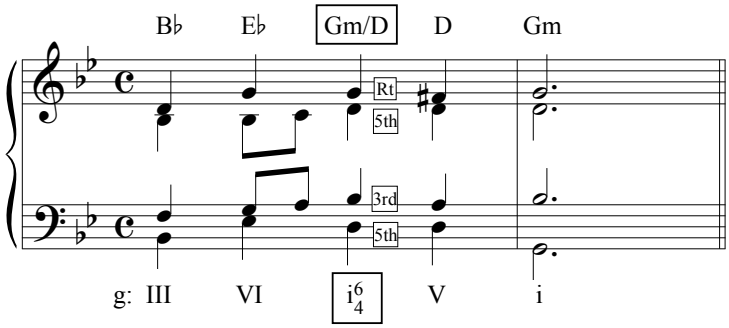


Figure 26.9.1 J.S. Bach, Chorale 204, "Wer weiß, wie nahe mir", BWV 166

26.10 Special Situations

Avoid parallel fifths when the *roots* of triads are a second apart, as in the following examples:

1. ii^6 to I$^6_4$ (see the first measure in the examples below)
2. I to vii$^{\circ 6}$ (see the second measure the in examples below)

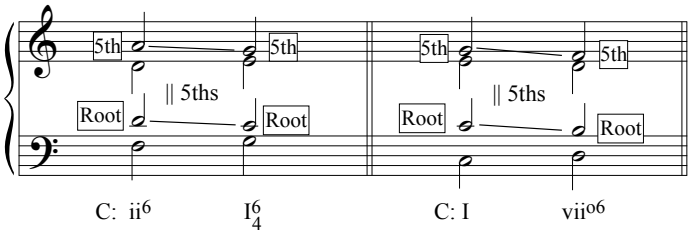


Figure 26.10.1 Parallel fifths when *roots* are a 2nd apart

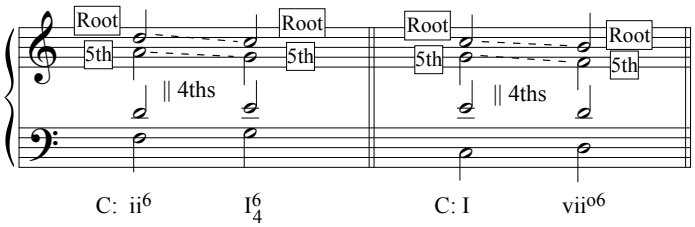


Figure 26.10.2 Parallel fourths as a corrective when roots are a 2nd apart

In any such situation where the roots are a second apart (even if the chords are inverted), revoice each chord so the 5th of the chord is *below* the root of the chord in the upper voices

26.11 Types of Six-Four Chords

When you are harmonizing melodies and writing music, there are three situations where it is appropriate to use a $^6_4$ chord.

1. Pedal $^6_4$
2. Passing $^6_4$
3. Cadential $^6_4$

The pedal $^6_4$ typically occurs in the patterns I–IV$^6_4$–I or V–I$^6_4$–V.

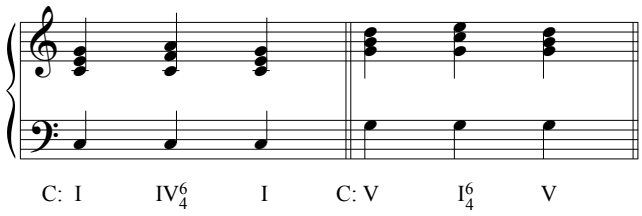


Figure 26.11.1 Examples with the Pedal Six-Four

The passing $^6_4$ typically occurs in the patterns I–V$^6_4$–I^6 (or its retrograde) and IV–I$^6_4$–IV^6 (or its retrograde).

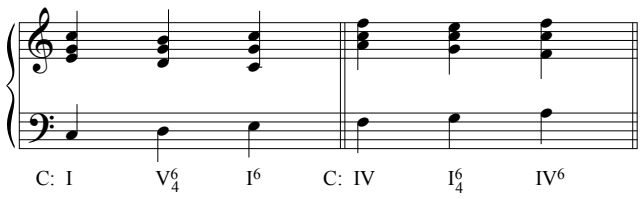


Figure 26.11.2 Examples with the Passing Six-Four

In an earlier section we discussed the Cadential $^6_4$ chord. Please refer to that section to review the cadential $^6_4$ chord.

26.12 Summary of Doubling Rules for Triads

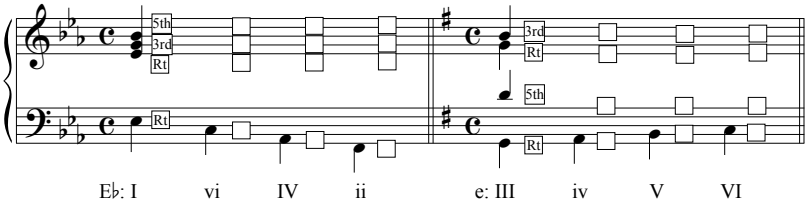
To generalize, here are the doubling rules for voice leading triads in root position, first inversion, and second inversion:

- Root Position Chords: DOUBLE THE BASS
- First-Inversion Chords: DO NOT DOUBLE THE BASS
  - Exception: vii$^{\circ 6}$ and ii$^{\circ 6}$: DOUBLE THE BASS
  - Exception: Consecutive first inversion chords—alternate between DOUBLE THE BASS and DO NOT DOUBLE THE BASS
- Second-Inversion Chords: DOUBLE THE BASS

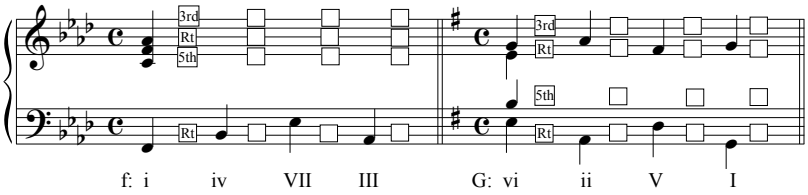
26.13 Practice Exercises

Exercise Group. Day One

1. For bass movement of a 3rd or 6th, in the upper voices hold two common tones and move the other voice by step. For bass movement of a 2nd, move the upper voices in contrary motion to the bass with the exception of the deceptive progression, which has special rules. Keep track of doubling by specifying which voice has the root, third, or fifth for each chord.

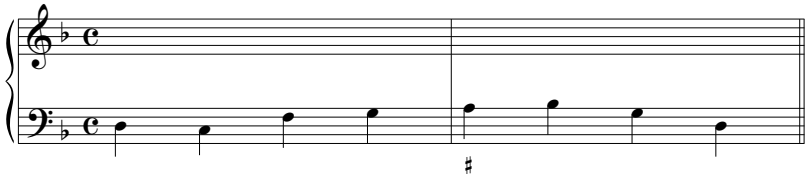


2. For bass movement of a 4th, either (1) hold one common tone and move the two voices by step, or (2) move the upper voices in the same direction. Keep track of doubling by specifying which voice has the root, third, or fifth for each chord.



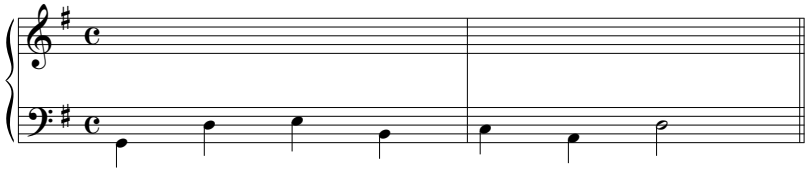
Exercise Group. Day Two

3. Given the bass line and figured bass symbols, analyze the Roman numerals below the staff and add soprano, alto, and tenor parts in "chorale-style," following rules of good voice leading. Choose the beginning register for each upper part carefully, considering the number of times the bass moves by the interval of a 2nd.



d: ___ ___ ___ ___ ___ ___ ___ ___

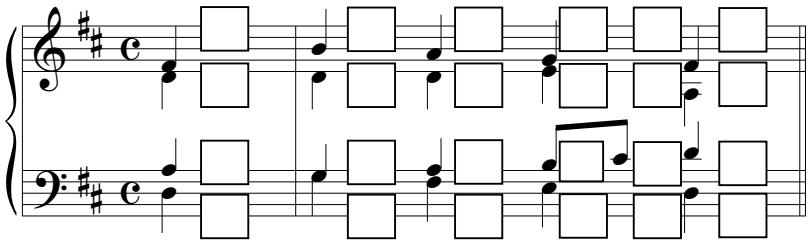
4. Given the bass line, analyze the Roman numerals below the staff and add soprano, alto, and tenor parts in "keyboard-style" (all three upper voices in the treble clef), following rules of good voice leading. Choose the beginning register for each upper part carefully, considering the direction of the bass line.



G: ___ ___ ___ ___ ___ ___ ___

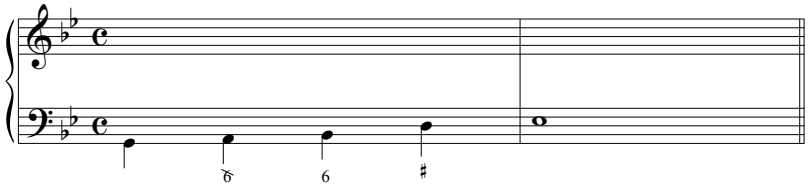
Exercise Group. Day Three

5. Analyze the Roman numerals in the blanks below the staff and the doublings of the chords in the squares—specifying Root, 3rd, or 5th—for J.S. Bach's Chorale 367, *Befiehl du deine Wege*.



D: ___ ___ ___ ___ ___ ___

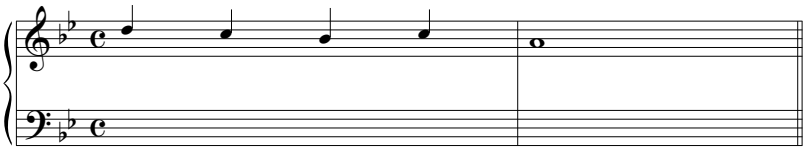
6. Given the bass line and figured bass symbols, analyze the Roman numerals and add soprano, alto, and tenor parts in chorale style. Review the special rule for doubling in diminished triads in first inversion. You may wish to review figured bass with chromatic alterations.



g: ___ ___ ___ ___ ___

7. Harmonize the melody making sure your progression follows the Harmonic Flowchart (analyze the harmonic function of each chord, abbreviated as "HF"), then add alto, tenor, and bass parts in chorale

style following rules of good voice leading. Use first-inversion chords to make a smoother bass line.

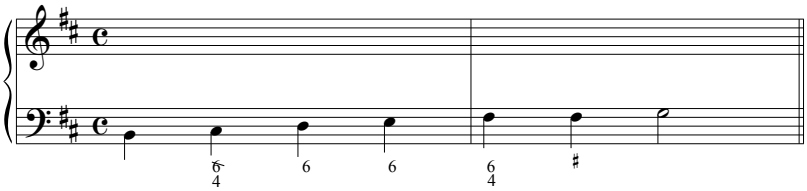


B♭: ____ ____ ____ ____ ____

HF: ____ ____ ____ ____ ____

Exercise Group. Day Four

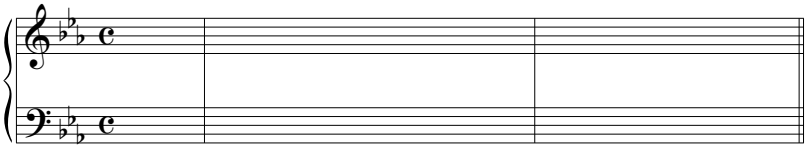
8. Analyze the figured bass symbols to specify Roman numerals with inversion symbols below the staff. Add soprano, alto, and tenor parts in keyboard style. Specify root, third, and fifth for every chord. Additionally, specify the six-four chord type (pedal, passing, or cadential).



b: ____ ____ ____ ____ ____ ____ ____

$\frac{6}{4}$ chord type: ____ ____

9. For the given Roman numeral progression, provide soprano, alto, tenor, and bass voices in chorale style. Be careful not to exceed any voice's range. Specify root, third, and fifth for every chord. Additionally, specify the six-four chord type.



c: i iv i^6_4 iv^6 ii^{o6} i^6_4 V VI

$\frac{6}{4}$ chord type: ____ ____

Click here to download the first homework assignment for this chapter.

Click here to download the second homework assignment for this chapter.

Click here to download the third homework assignment for this chapter.

Click here to download the fourth homework assignment for this chapter.

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Chapter 27

Voice Leading Seventh Chords

27.1 Voice Leading Seventh Chords

There is one general rule for voice leading any seventh chord: resolve the 7th of the chord down by step. All other voices should move smoothly to the nearest chord tone in a voicing containing the appropriate doubling.

Principle 27.1.1 7th chords. *Resolve the 7th of a 7th chord down by step.*

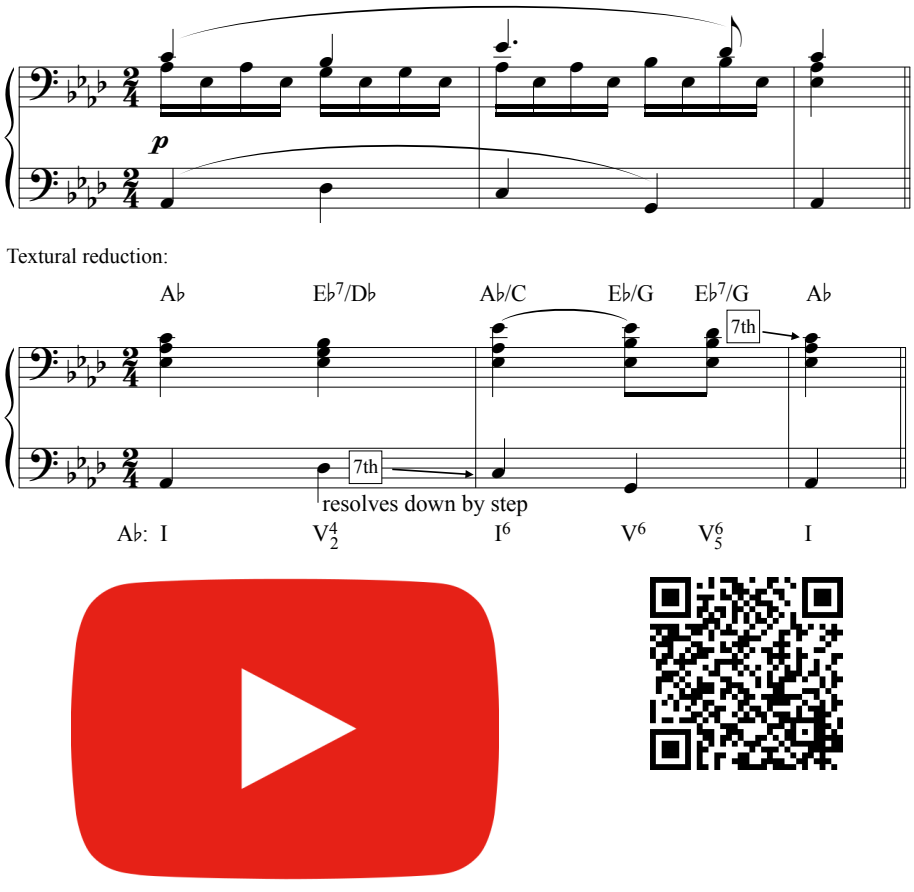


Figure 27.1.2 Beethoven, Pathétique Sonata, Op. 13, II.

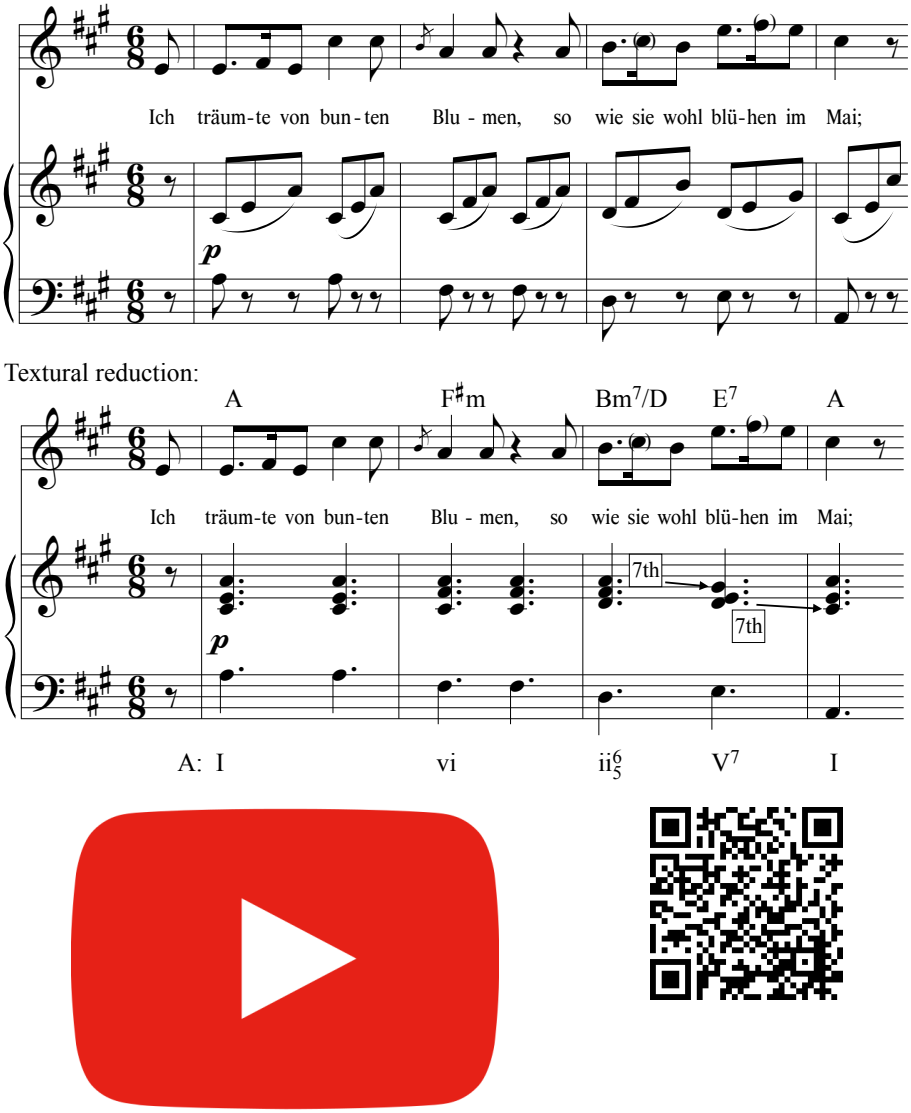


Figure 27.1.3 Schubert, *Winterreise*, D. 911, "Frühlingstraum" (1823)

The one exception to this is in the progression $\text{I}–\text{V}^4_3–\text{I}^6$, which closes the theme of the first movement of Mozart's Piano Sonata K. 331.

Figure 27.1.4 Mozart, Piano Sonata K. 331, I

In the example below, one can see that the 7th resolves up by step.

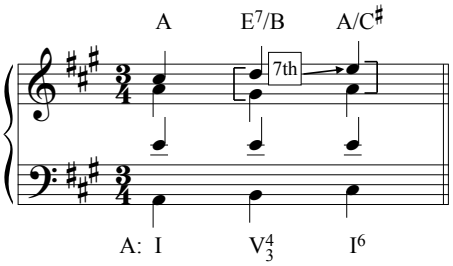


Figure 27.1.5 The $\text{I}–\text{V}^4_3–\text{I}^6$ progression with acceptable parallel fifths

Notice that parallel fifths occur in this progression because of the upward resolution of the 7th. These parallel fifths may have been deemed less objectionable because they consist of **unequal fifths** (where one of the fifths is in a case of parallel fifths is diminished).

27.2 Voice Leading Successive Seventh Chords

Sometimes you will encounter a situation where there are successive seventh chords. This is especially the case in circle of fifth progressions. When voice leading a circle of fifths progression with root position seventh chords in four parts (SATB), alternate between incomplete seventh chords (without the fifth of the chord) and complete seventh chords, as can be seen in the example below from Vivaldi's Concerto for Two Violins and Cello in D minor, RV 565.

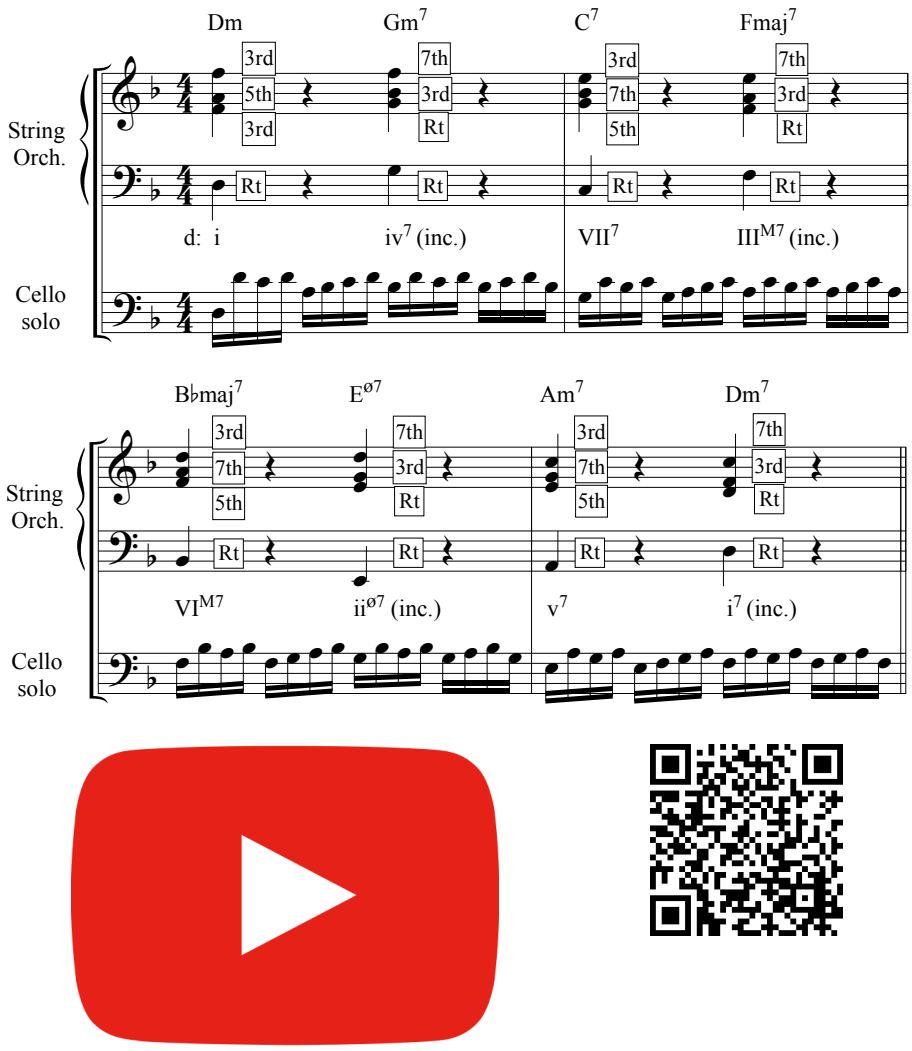


Figure 27.2.1 Vivaldi, Concerto for Two Violins and Cello in D minor, RV 565, V.

Principle 27.2.2 Voice Leading Successive Root Position 7th chords. *Alternate between complete and incomplete voicings.*

If, on the other hand, you are asked to voice lead a circle of fifths progression involving inverted seventh chords, always resolve the seventh of each chord down by step and move the other voices smoothly. You will see the following pattern: two voices will remain on common tones (shown with ties) while the other two voices resolve downward by step.

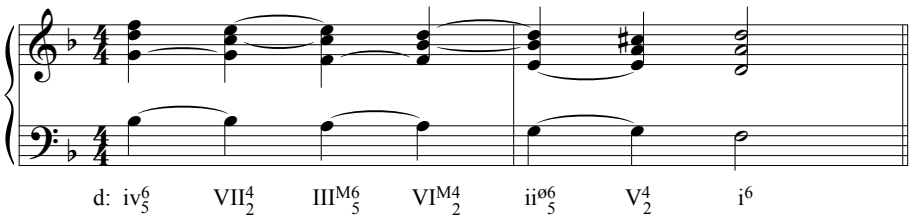


Figure 27.2.3 Circle of fifths progression with inverted 7th chords (alternating $\frac{6}{5}$ and $\frac{4}{2}$)

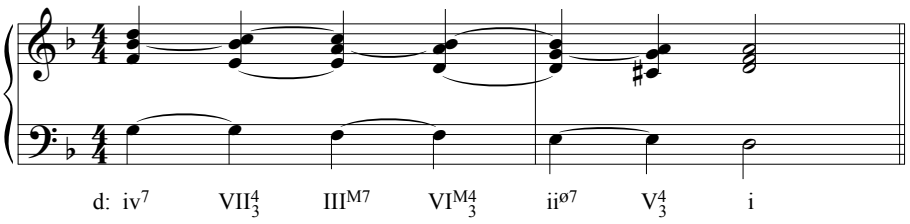


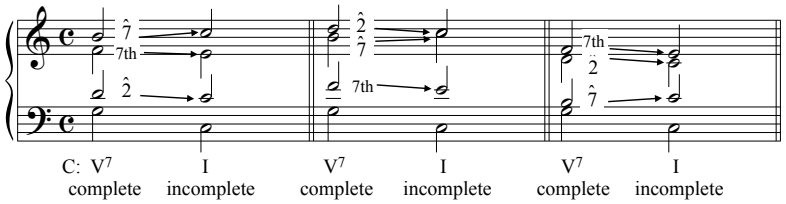
Figure 27.2.4 Circle of fifths progression with alternating ^{7} and $^4_3$ chords

27.3 Voice Leading the V^7 to I Progression

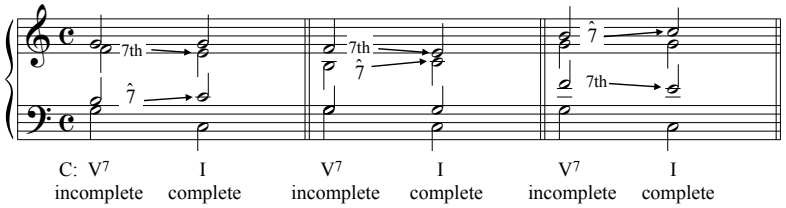
In voice leading the V^7 to I progression in four parts, one must deliberately choose one of the following methods:

1. "Strict" resolution:

   (a) Complete V^7 to incomplete I: resolve $\hat{7}$ up and $\hat{4}$ and $\hat{2}$ down. This means resolving the 3rd of the V^7 chord ($\hat{7}$) up and the 7th and 5th of the V^7 chord down. For the sake of consistency in terminology, the examples below label $\hat{7}$, $\hat{2}$, and the 7th of the chord. The incomplete I chord will have a tripled root and one 3rd.

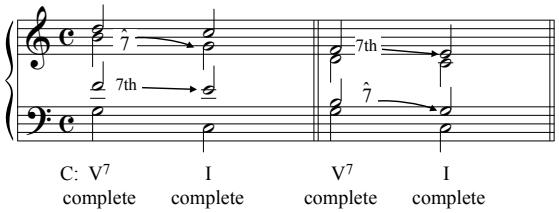


   (b) Incomplete V^7 (no fifth) to complete I.



2. "Free" resolution:

   (a) If $\hat{7}$ is not in the soprano part, you can resolve it down by the interval of a third to $\hat{5}$.



In piano music you will sometimes find "improper" resolution of the 7th of a chord because it fits the hand better. This should be considered an exception and will not be acceptable in voice leading exercises completed for this class.

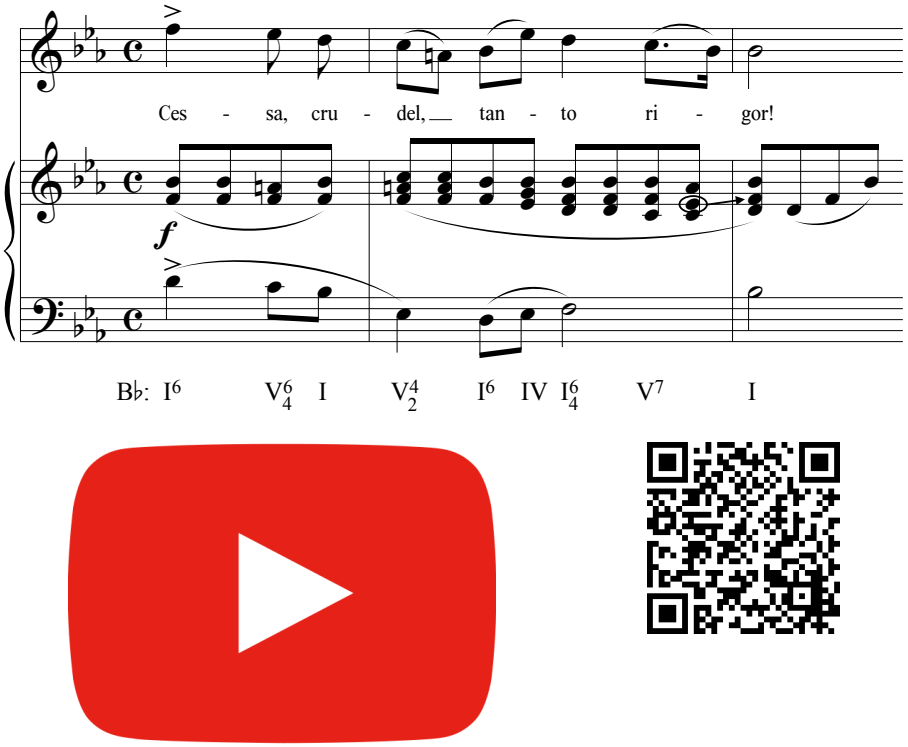
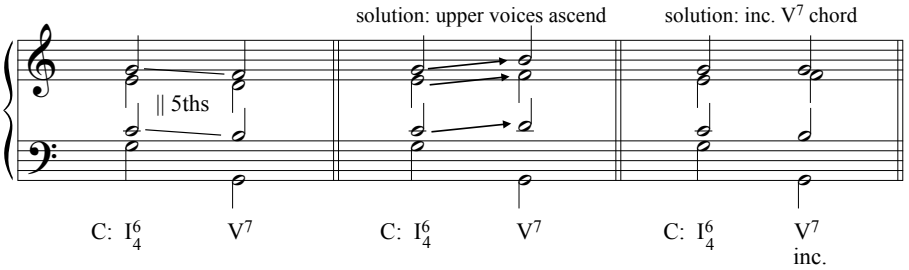


Figure 27.3.1 Giuseppe Giordani, *Caro mio ben* (1783)

27.3.1 Voice Leading I_4^6 to V^7

When I_4^6 resolves to V^7, beware of parallel fifths if the fifth is above the root in the I_4^6 chord. If it is, move all upper voices upward to the closest notes of the V^7 chord, or to an incomplete V^7 (no 5th).



27.4 The Special Resolution of vii$^{\circ 7}$ (and vii$^{\emptyset 7}$)

The vii$^{\circ 7}$ and vii$^{\emptyset 7}$ chords consist entirely of tendency tones ($\hat{7}$, $\hat{2}$, $\hat{4}$, $\hat{6}$). If one resolves all of those tendency tones correctly ($\hat{2}$–$\hat{1}$, $\hat{4}$–$\hat{3}$, $\hat{6}$–$\hat{5}$, $\hat{7}$–$\hat{8}$), one might write parallel 5ths depending on the voicing of the vii$^{\circ 7}$ and vii$^{\emptyset 7}$ chord. Therefore, be sure to memorize the following principle:

Principle 27.4.1 Resolving vii$^{\circ 7}$. *When the 7th of a vii$^{\circ 7}$ or vii$^{\emptyset 7}$ chord is voiced above the 3rd of the chord, resolve the 3rd of the chord (scale degree $\hat{2}$) up by step while resolving all other tendency tones normally ($\hat{4}$–$\hat{3}$, $\hat{6}$–$\hat{5}$, $\hat{7}$–$\hat{8}$).*

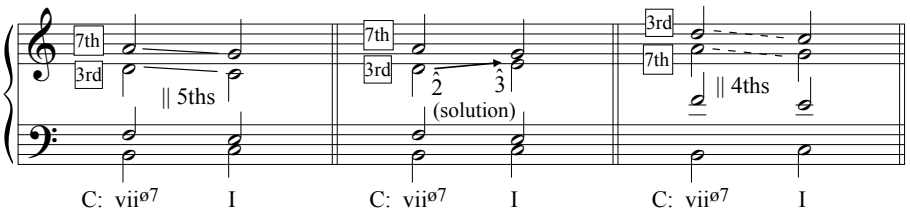


Figure 27.4.2 Resolving $\text{vii}^{\text{ø}7}$

The third measure above shows that revoicing the chord is another solution, since parallel 4ths are not objectionable in this situation.

If the 7th of the chord is voiced *below* the 3rd of the chord, resolve all tendency tones normally.

27.5 When to Use Seventh Chords

In your harmonizations of melodies, it is best to use seventh chords to add tension as you approach tonic function. Therefore, sevenths are added most frequently to chords of dominant function (V and vii°) and chords of pre–dominant function (ii and, to a lesser extent, IV). (See the harmonic flowchart.) For this reason, seventh chords like iii^7, vi^7, IVM^7, and IM^7 are less commonly used and encountered.

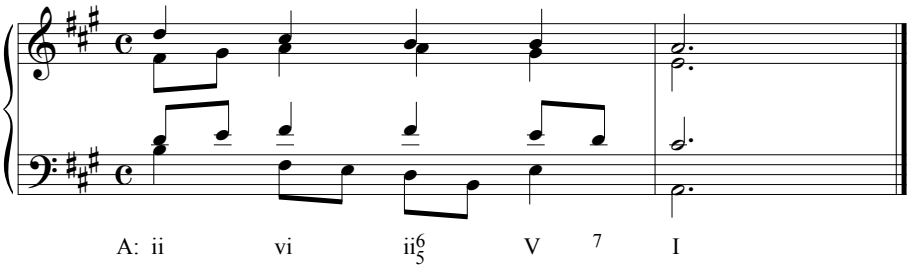
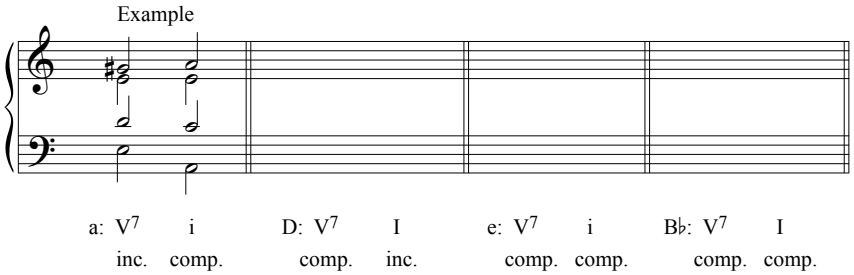


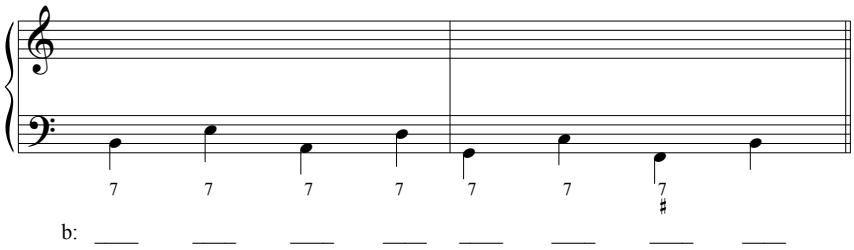
Figure 27.5.1 J.S. Bach, Chorale 342, "Lobt Gott, ihr Christen, allzugleich", BWV 376

27.6 Practice Exercises

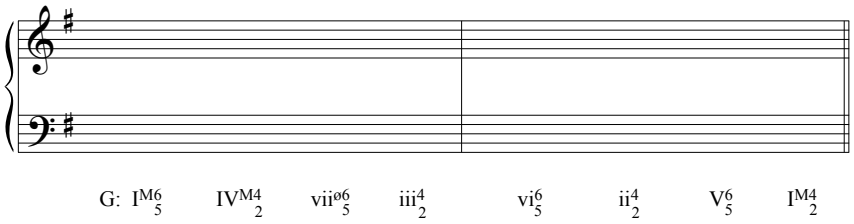
1. Voice lead each V^7 chord to the tonic using either "strict" or "free" resolution as indicated by the terms incomplete ("inc.") and complete ("comp."). Include key signatures.



2. Voice lead this circle of fifths progression involving root position seventh chords. Include the key signature and analyze the figured bass symbols in order to place Roman numerals in the blanks below the staff.



3. Voice lead this circle of fifths progression involving inverted seventh chords.



Click here to download the homework assignment for this chapter.
Click here to download the Unit 8 Practice Test.

Chapter 28

Voice Leading With Non-Chord Tones

28.1 Voice Leading With Non-Chord Tones

Non-chord tones are common in J.S. Bach's *371 Chorales*, which are our model for voice leading.

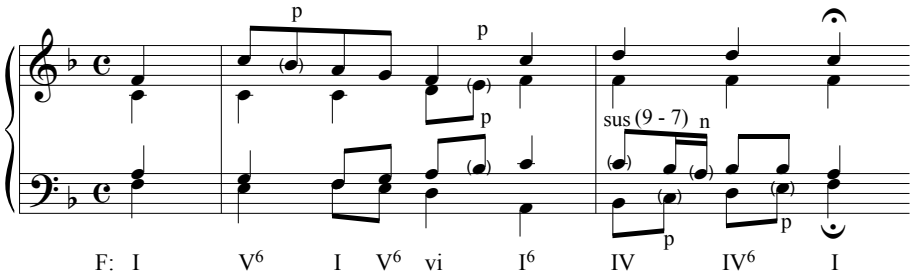


Figure 28.1.1 J.S. Bach, Chorale 323, "Wie schön leuchtet der Morgenstern", BWV 172

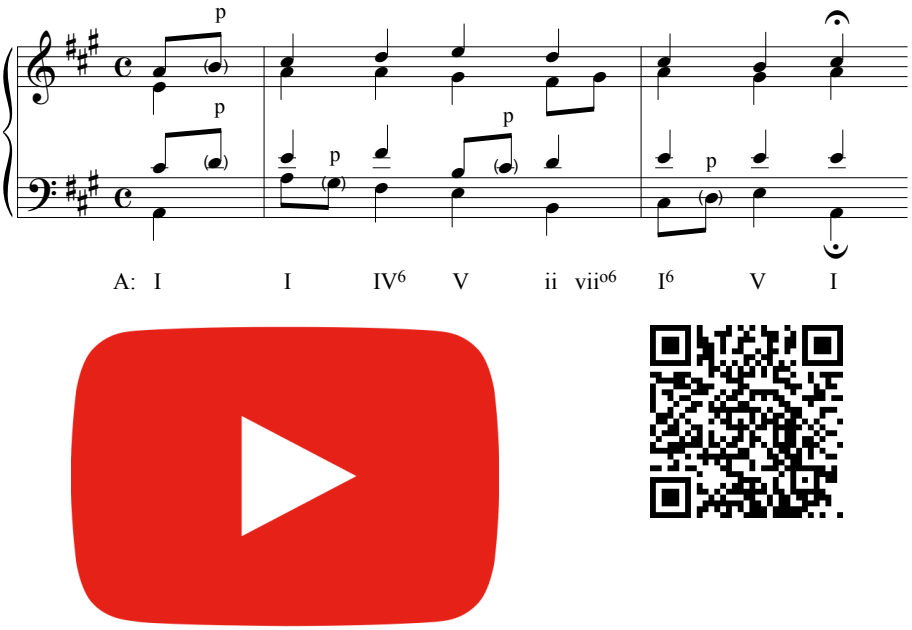


Figure 28.1.2 J.S. Bach, Chorale 326, "Allein Gott in der Höh' sei Erh', BWV 104", BWV 172

28.2 Avoiding Objectionable Parallels

When adding non-chord tones, one must avoid creating objectionable parallels. To avoid creating parallel 5ths and 8ves when adding non-chord tones, first identify intervals of 5ths and 8ves between voices in your original voice leading.

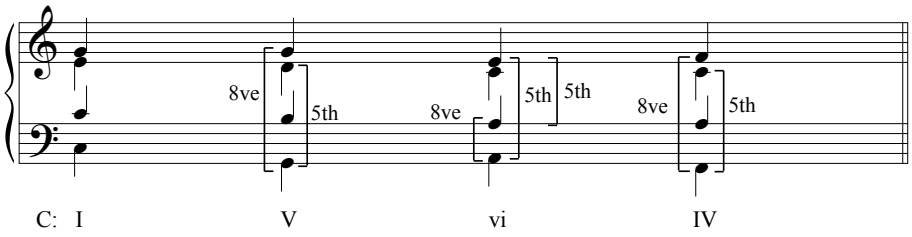


Figure 28.2.1 Progression with 8ves and 5ths identified

Avoid adding non-chord tones that move by step into notes separated by a 5th or 8ve.

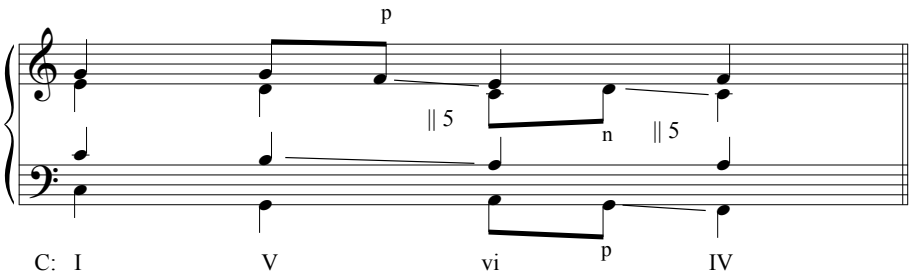


Figure 28.2.2 Parallel 5ths and 8ves created by non-chord tones

It is best to avoid adding non-chord tones in two voices on the same beat unless they are moving in parallel 3rds or 6ths.

28.3 Adding Non-Chord Tones to a Chord Progression

Here are ideas for how to add non-chord tones (or "embellishments") to one of the voice parts of an SATB chord progression.

1. Repeated note: add upper or lower neighbor

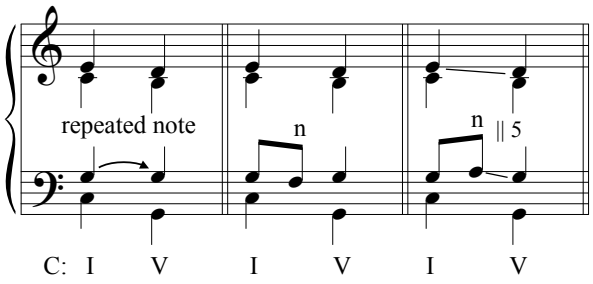


Figure 28.3.1

2. Step down:

   (a) Add a suspension by delaying the resolution of the note

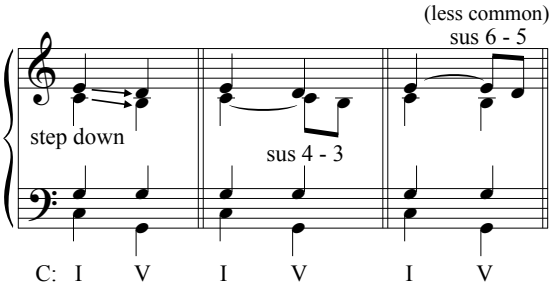


Figure 28.3.2

   (b) Add an escape tone by moving by step in the opposite direction of the original stepwise movement, then leap

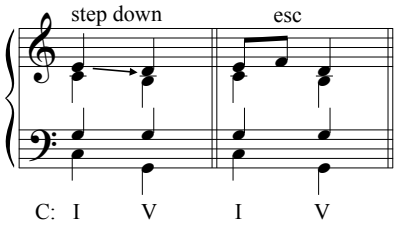


Figure 28.3.3

   (c) Add a double neighbor

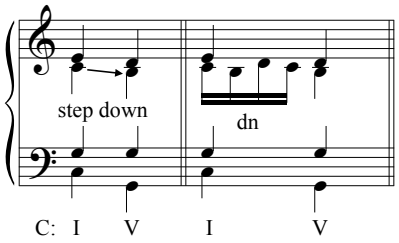


Figure 28.3.4

(d) Add a chromatic passing tone

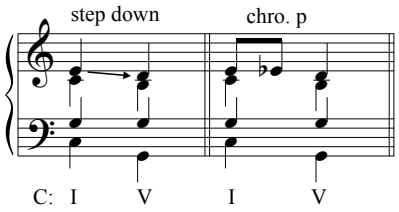


Figure 28.3.5

(e) Add an anticipation

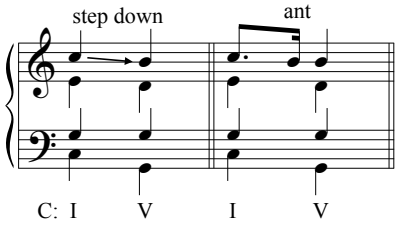


Figure 28.3.6

3. Step up:

(a) Add a chromatic passing tone

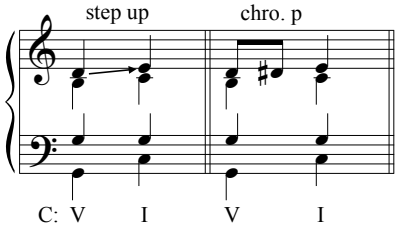


Figure 28.3.7

(b) Add an anticipation

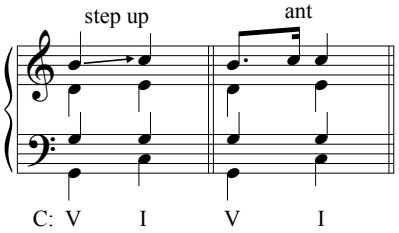


Figure 28.3.8

(c) Add an appoggiatura by leaping one step beyond the note of resolution, placing the appogiatura on the beat, displacing the note of resolution to occur after the beat

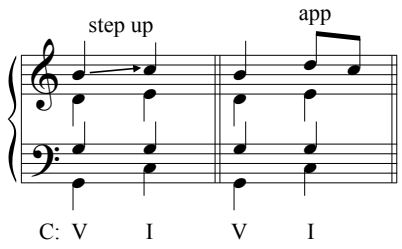


Figure 28.3.9

(d) Add a double neighbor

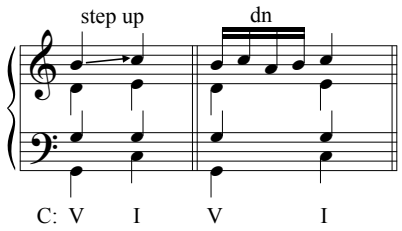


Figure 28.3.10

(e) Add retardation by delaying resolution of the note (rarely used)

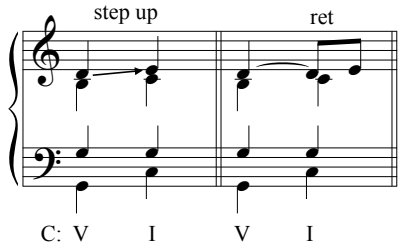


Figure 28.3.11

4. Leap of 3rd:

(a) Fill in the 3rd with a passing tone

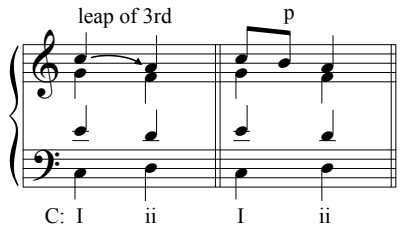


Figure 28.3.12

(b) Add an appoggiatura by leaping one step beyond the note of resolution, placing the appogiatura on the beat, displacing the note of resolution to occur after the beat

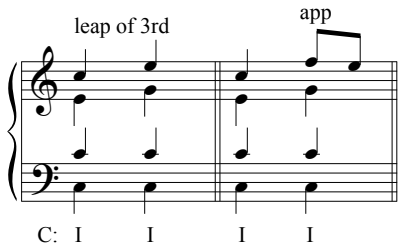
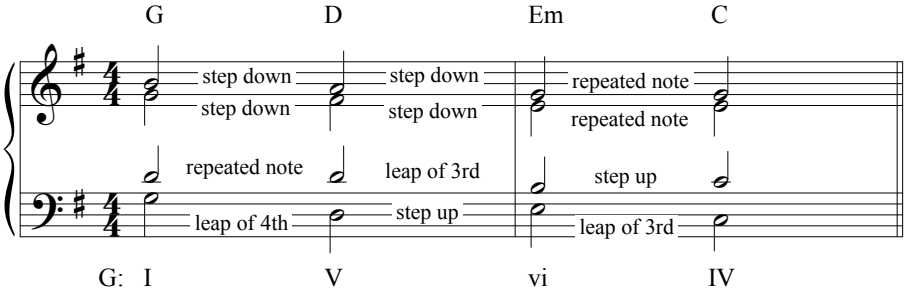


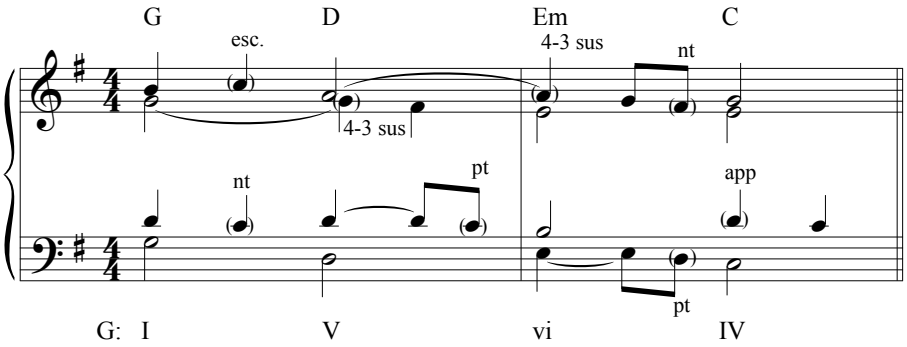
Figure 28.3.13

5. Leaps of 4th or larger: do not embellish (for now)

Here is a basic framework with all possibilities labeled.



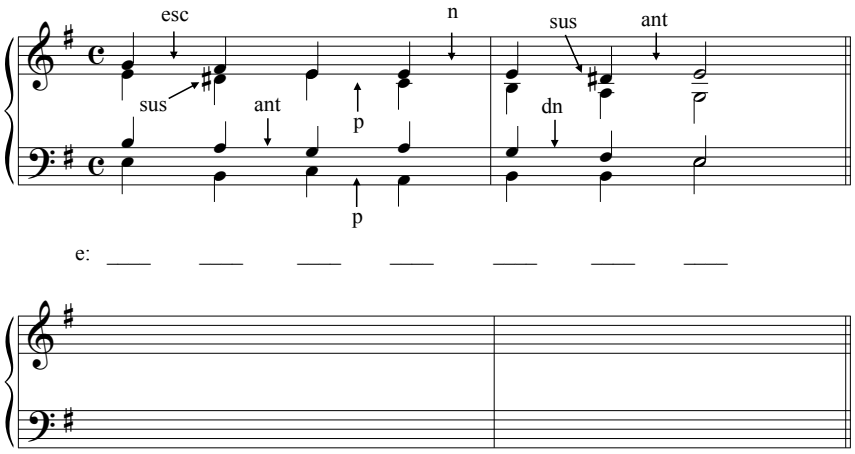
Here is one possible solution:



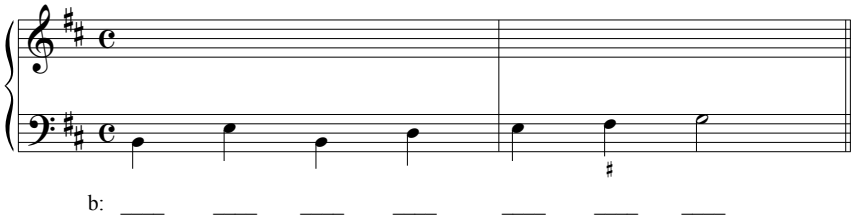
Notice that, when non-chord tones are added to different voices on the same beat, consonant intervals (3rds, 5ths, 6ths, or 8ves) are made. If consonant intervals can't be made, the voices are staggered rhythmically (as occurs on beats 3 and 4 in measure one of the example above).

28.4 Practice Exercises

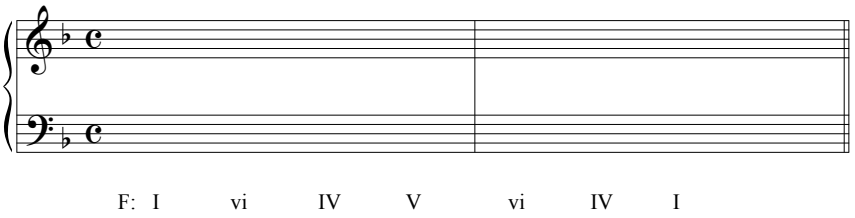
1. Analyze the chords with Roman numerals in the blanks below the staff, then add the specified non-chord tones, specifying suspensions with the appropriate interval numbers.



2. Analyze the figured bass below to write Roman numerals in the blanks below the staff. Then add the following non-chord tones: (1) 3 suspensions, (2) one passing tone, (3) one neighbor tone, and (4) one anticipation.



3. Voice lead the following Roman numeral progression then add the following non-chord tones: (1) a neighbor tone during beat one, (2) a neighbor tone during beat two, (3) an appoggiatura on beat 3, (4) a suspension on beat four, (5) a suspension on beat 5, (6) an anticipation during beat six, and (7) a suspension on beat 7.



Click here to download the homework assignment for this chapter.

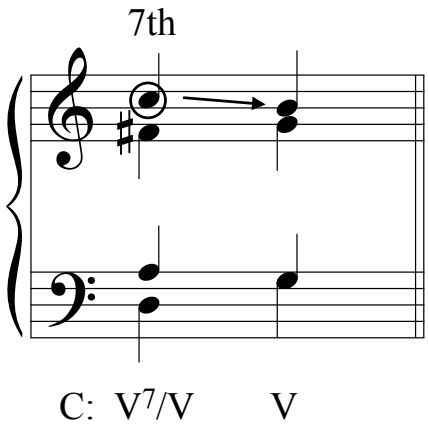
Chapter 29

Voice Leading Chromatic Harmonies

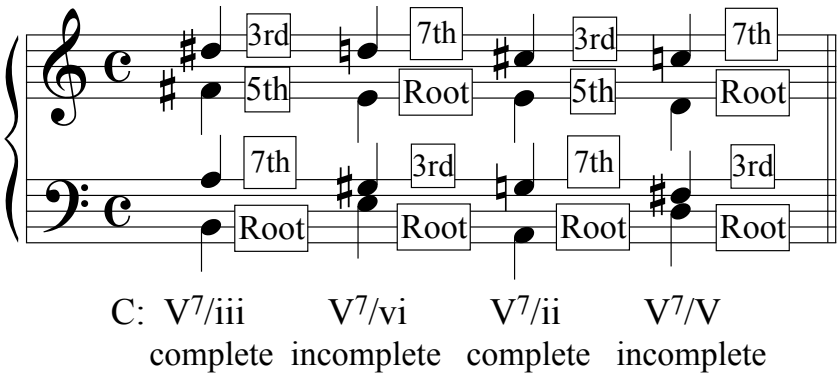
29.1 Voice Leading Secondary Chords

When voice leading secondary chords, one largely follows voice leading rules for seventh chords:

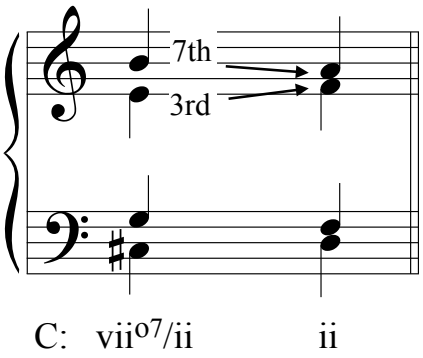
1. Resolve the 7th of a chord down by step.



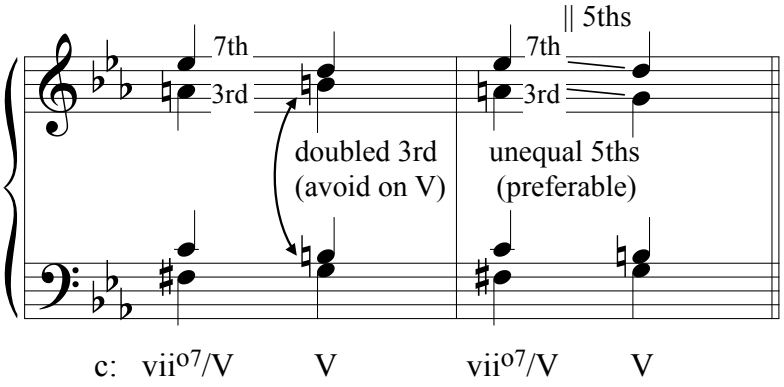
2. Alternate complete voicings with incomplete voicings when voice leading successive root position seventh chords . Note that with secondary chords, the 3rd of the chord, typically a raised note, will resolve down by half step to the 7th of the next chord, which is a diatonic note that cancels out the chromaticism of the previous note.



3. Follow the principle for resolving vii$^{\circ 7}$ and vii$^{\emptyset 7}$ when dealing with secondary vii$^{\circ 7}$ and vii$^{\emptyset 7}$ chords.



(a) An important exception occurs when vii$^{\circ 7}$/V or vii$^{\emptyset 7}$/V resolves to V. If the melody requires the 7th of the chord to be voiced above the 3rd of the chord, solve the example by writing parallel (unequal) fifths instead of the doubling of the leading tone, which is considered less acceptable.



29.2 Voice Leading Borrowed Chords

Borrowed chords, or chords making use of mode mixture, are handled similarly to their diatonic versions in terms of voice leading, e.g., ii$^{\emptyset 7}$ is handled similarly to ii^7. In any of the borrowed chords with $\flat\hat{6}$, resolve this tendency tone down by step whenever possible.

Principle 29.2.1 Voice Leading Borrowed Chords. *Resolve* ♭$\hat{6}$ *down by step when it is a chord member of a borrowed chord.*

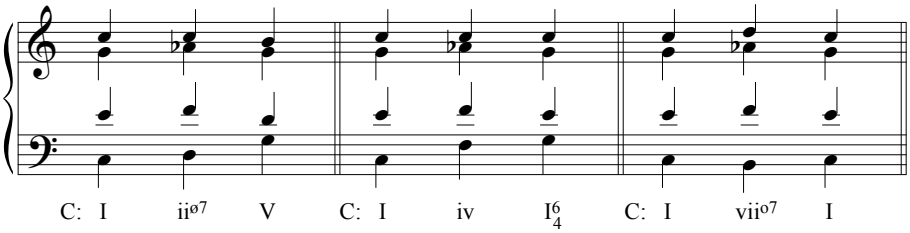


Figure 29.2.2 Resolving ♭$\hat{6}$ down when voice leading borrowed chords

Another situation where you may encounter a borrowed chord is the V–♭VI cadence, which should be handled the same as the deceptive cadence in minor (see Principle 26.7.4)—resolve the 3rd of the V chord up by step and move the other two voices in contrary motion to the bass.

There are no specific rules for other borrowed chords such as ♭III, ♭VII, i, and v; simply voice lead them as smoothly as possible while avoiding objectionable parallels.

29.3 Voice Leading the Neapolitan Chord

There are two rules for voice leading the N^6 chord in four parts:

1. Double the bass (the third)
2. Resolve ♭$\hat{2}$ *down* to the nearest note in the next chord.

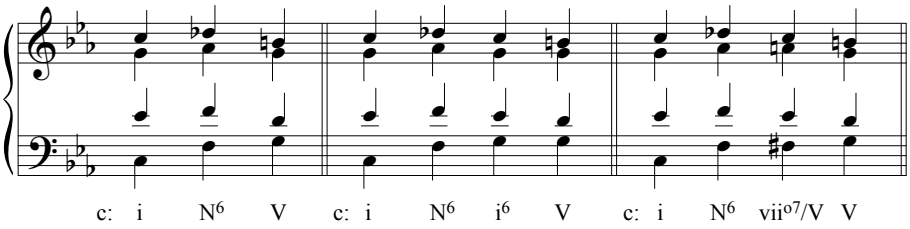


Figure 29.3.1 Resolving ♭$\hat{2}$ down when voice leading N^6

29.4 Voice Leading Augmented Sixth Chords

It may be helpful to review the three types of augmented sixth chords before discussing how one voice leads them.

The salient accidental in all three augmented sixth chords is ♯$\hat{4}$, which almost always resolves upward to $\hat{5}$.

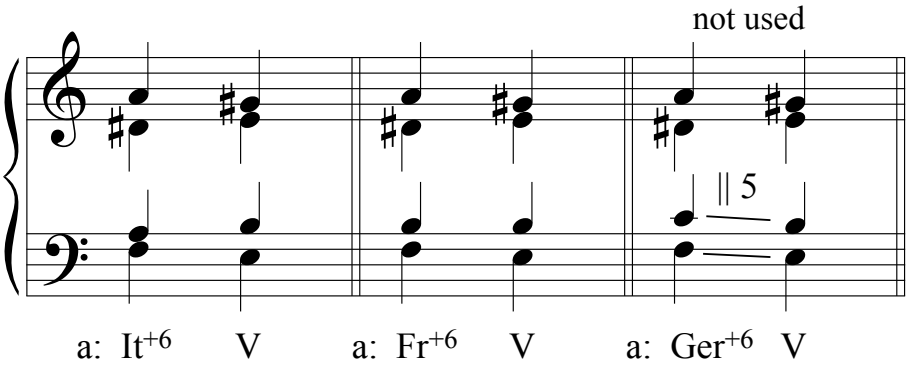


Figure 29.4.1 $\sharp\hat{4}$ to $\hat{5}$ in resolution to V

The $\sharp\hat{4}$ scale degree also resolves to $\hat{5}$ when an augmented sixth chord resolves to the Cadential $^{6}_{4}$ chord.

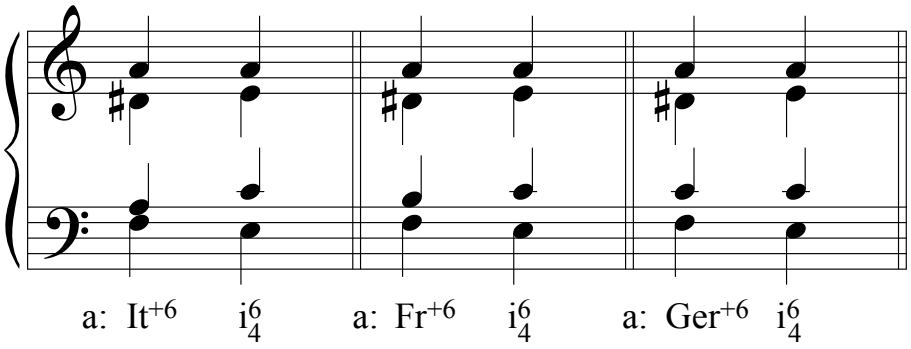


Figure 29.4.2 $\sharp\hat{4}$ to $\hat{5}$ in resolution to Cadential $^{6}_{4}$

With the enharmonic German augmented sixth chord (abbreviated EnGer^{+6}, containing $\flat\hat{6}$, $\hat{1}$, $\sharp\hat{2}$, and $\sharp\hat{4}$), $\sharp\hat{2}$ and $\sharp\hat{4}$ resolve upward to members of a major I^{6}_{4} chord.

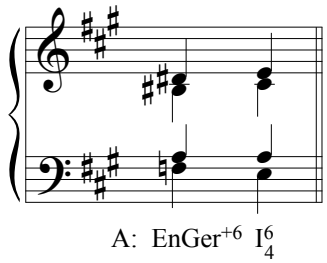


Figure 29.4.3 $\sharp\hat{2}$ to $\sharp\hat{2}$ resolving upward when in an EnGer^{+6}

The exception to $\sharp\hat{4}$ to $\hat{5}$ occurs when an augmented sixth chord resolves to V^{7}, in which case $\sharp\hat{4}$ resolves to $\flat\hat{4}$, which is the 7th of the V^{7} chord.

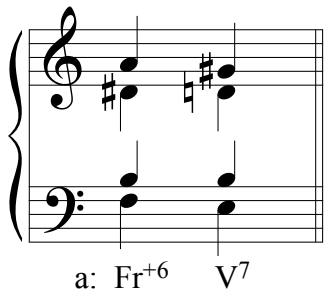


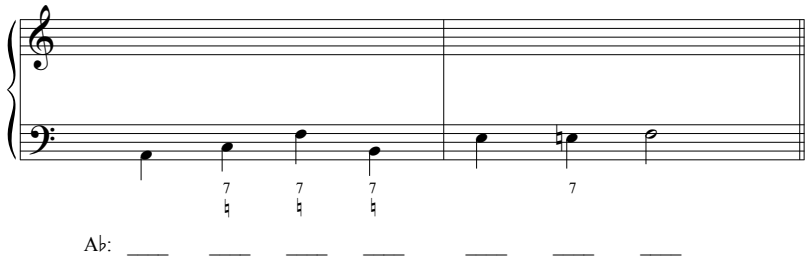
Figure 29.4.4 $\sharp\hat{4}$ to $\flat\hat{4}$ in resolution to V^7

If you voice lead an augmented sixth chord to something other than V, V^7, or i^6_4, move all of the voices smoothly while avoiding objectionable parallels and employing proper doublings.

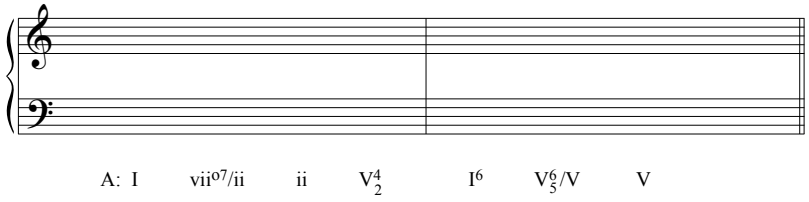
29.5 Practice Exercises

Exercise Group. Day One

1. Analyze the figured bass to provide Roman numerals in the blanks below the staff, then voice lead the progression. Include the key signature.



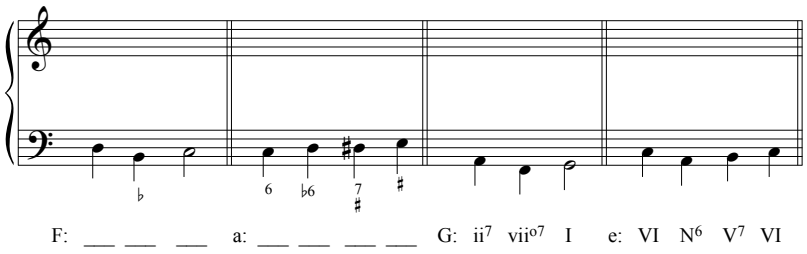
2. Voice lead the following Roman numeral progression. Include the key signature. Add the following non-chord tones: 1 suspension, 1 passing tone, 1 anticipation, and 3 neighbor tones.



Exercise Group. Day Two

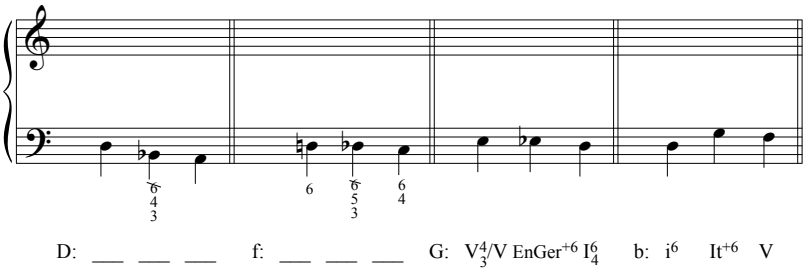
3. Analyze the figured bass to provide Roman numerals in the blanks below the staff, then voice lead the progressions in chorale style. Include

the key signatures. Include one suspension in each measure.



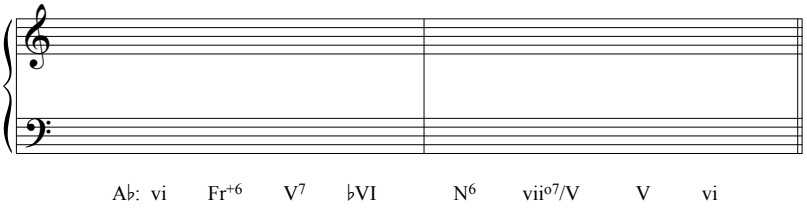
Exercise Group. Day Three

4. Analyze the figured bass to provide Roman numerals in the blanks below the staff. Voice lead the progressions in chorale style. Include the key signatures.



Exercise Group. Day Four

5. Voice lead the following Roman numeral progression. Include the key signature. Add the following non-chord tones: an escape tone, a 4-3 suspension, an anticipation, and a passing tone.



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Click here to download the third homework assignment for this chapter.
Click here to download the fourth homework assignment for this chapter.
Click here to download the Unit 9 Practice Test.

Chapter 30

Introduction to Counterpoint

30.1 Species Counterpoint

The seminal composition text, *Gradus ad Parnassum* (1725), by Johann Joseph Fux, teaches contrapuntal composition through "species counterpoint." **Species counterpoint** uses simple rhythmic values and teaches composers how to write one, two, three, or four notes against a larger value, usually a whole note. In this text, we will focus on writing for two voices. In a semester-long college course in counterpoint, one typically learns to write for up to four voices.

Counterpoint can be thought of as the simultaneous sounding of two or more melodic lines. An example is shown below.

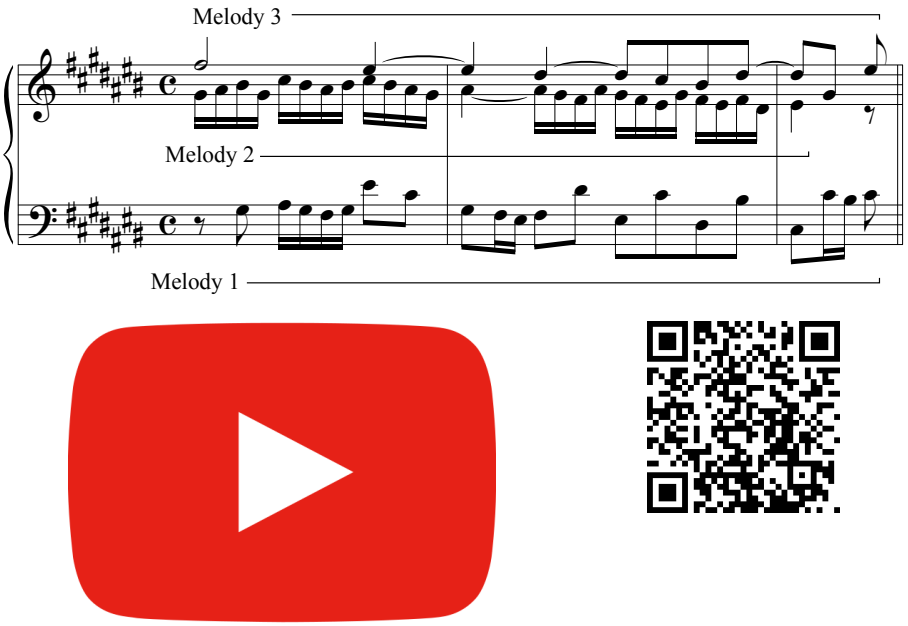
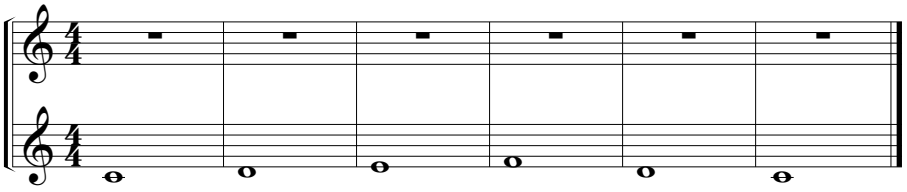


Figure 30.1.1 Bach, J.S., *Well-Tempered Clavier, Book I*, Fugue 3 in C-sharp major, BWV 848

Textures made of counterpoint are called "contrapuntal" and can be contrasted with melody-accompaniment textures, which are called "homophonic."

30.2 First Species Counterpoint

In first species, we will write note-against-note counterpoint in whole notes. You will be given a melody, called the *cantus firmus* (abbreviated "*c.f.*"), against which you will write a counterpoint.

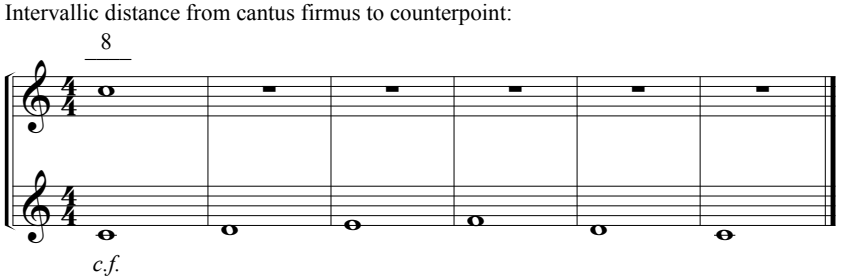


c.f. (*cantus firmus*, a pre-existing melody)

Figure 30.2.1

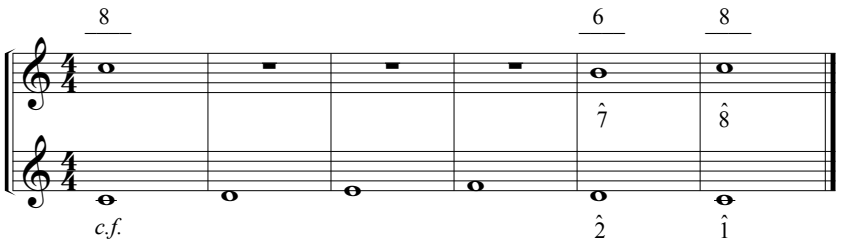
Fux enumerates several rules to follow to write in proper sixteenth-century style (the style of Palestrina). Since this is a brief introduction to writing in species counterpoint, the rules below are slightly modified and simplified. You would likely follow stricter rules in a semester-long course in counterpoint.

1. Begin with an octave or unison.

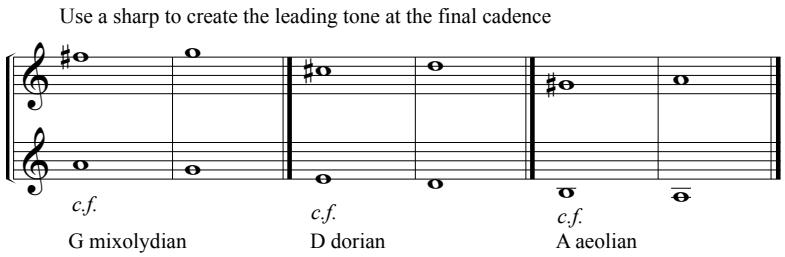


2. End on an octave or unison.

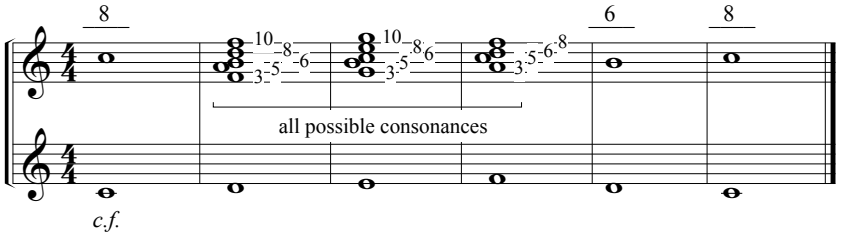
3. Approach the ending octave or unison by contrary motion; one of the parts will end with $\hat{7}$–$\hat{8}$ while the other ends with $\hat{2}$–$\hat{1}$.



   (a) If the example is in G mixolydian, D dorian, or A aeolian, use a sharp to create the leading tone (F♯, C♯, and G♯ respectively).



4. Create consonant harmonic intervals in each measure (unisons, 3rds, 5ths, 6ths, and their compound versions—10ths, 12ths, 13ths, etc.). Dissonances (2nds, 4ths, 7ths) are not allowed in first species counterpoint.



   (a) "Imperfect" consonances (3rds and 6ths) can be approached in any manner

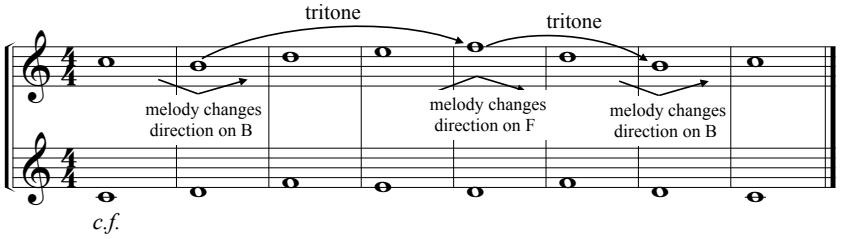
      i. Do not use more than three consecutive 3rds or 6ths

   (b) "Perfect" consonances (unisons, 5ths, 8ves, 12ths) may only be approached in *contrary* motion in order to avoid direct 5ths and direct 8ves (you may wish to review the Types of Motion).

   (c) When the *cantus firmus* is in the *upper* part, write consonant intervals of a unison, 3rd, 5th, or 6th *below* the *cantus firmus*.

5. Only the following leaps are allowed: 3rds, 4ths, 5ths, ascending minor sixths, and 8ves (review the Rules of Melody with regard to direction changes after leaps).

6. Avoid melodically outlining a tritone by changing directions at two turning points in a melody.



7. Avoid repeating notes in order to create a flowing melody

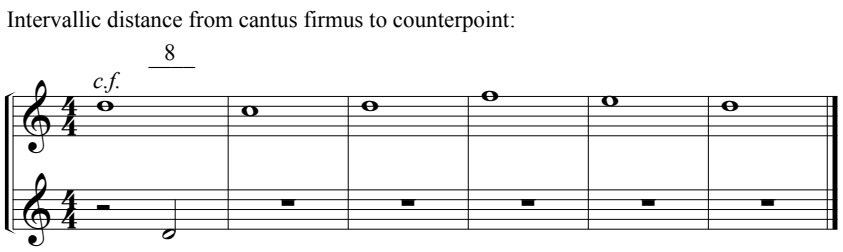
Following these rules may seem dry and uninspired, but these rules come from observations of note-by-note details in Renaissance compositions by composers like Palestrina and can make any composer better and more aware of what they are writing.

Go to First Species Practice Exercises.

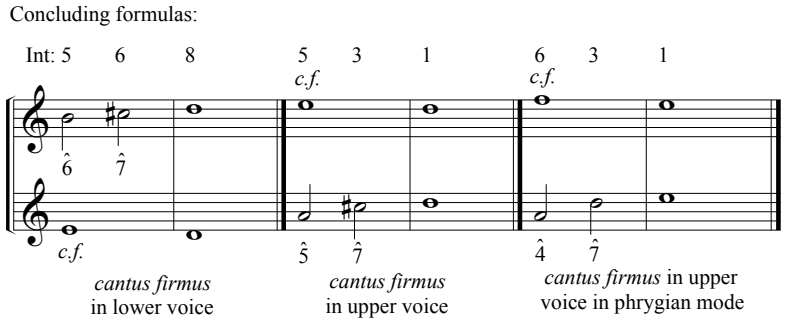
30.3 Second Species Counterpoint

In second species, one writes two half notes against a *cantus firmus* in whole notes. (Second species can also include writing three half notes against a *cantus firmus* of dotted whole notes in $\frac{3}{2}$.) The rules are generally the same as first species except that one simple dissonance is allowed in second species: the passing tone. Please see the details below.

1. Begin your counterpoint with a half note at the octave or unison on either the first or third beat of the measure; if starting on the third beat, put a half rest at the beginning of the measure.



2. End with a whole note on an octave or unison, using one of these concluding formulas:
   (a) If the *cantus firmus* is in the lower part, approach the final octave with intervals of a fifth and sixth ($\hat{6}$–$\hat{7}$ against $\hat{2}$ in the *cantus firmus*).
   (b) If the *cantus firmus* is in the upper part, approach the final octave or unison with the intervals of a fifth and third ($\hat{5}$–$\hat{7}$ against $\hat{2}$ in the *cantus firmus*).
   (c) Phrygian mode has an exception: if the cantus firmus is in the upper part, approach the final octave or unison with the intervals of a sixth to a third ($\hat{4}$–$\flat\hat{7}$ against $\flat\hat{2}$ in the *cantus firmus*).

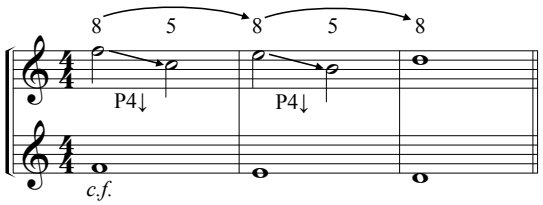


3. Of the two half notes you write in each measure, the first must always be a consonance (unison, 3rd, 5th, 6th, 8ve, or compound interval equivalent). If the second is a dissonance, it can only be a passing tone (approached and left by step). Otherwise, the second note must be a consonance. The only allowable leaps are the same as in first species.

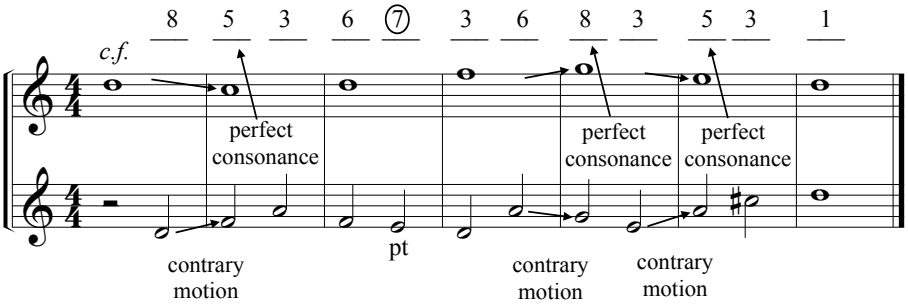
4. When crossing barlines, apply the following:
   (a) "Imperfect" consonances (3rds and 6ths) can be approached in any manner.
   (b) "Perfect" consonances (unisons, 5ths, 8ves, 12ths) may only be approached in contrary motion in order to avoid direct 5ths and direct 8ves.

(c) Do not repeat notes across barlines

5. Avoid 8ves on consecutive downbeats and avoid 5ths on consecutive downbeats *unless* there is the leap of 4th occurring after the 8ve or 5th on the downbeat



Notice that dissonant interval numbers (2, 4, tt, 7) are circled to highlight that they must be handled in a special manner.



Go to Second Species Practice Exercises.

30.4 Third Species Counterpoint

In third species, one writes four quarter notes to each whole note in the cantus firmus. Use the following rules.

1. Begin on an octave or unison. Write four quarter notes to each whole note in the cantus firmus except for the final measure.

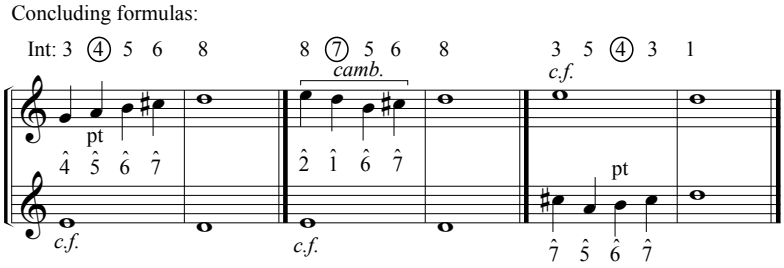
2. End on a whole note on an octave or unison with the penultimate measure using one of the following formulas:

   (a) If the cantus firmus is in the lower voice, the penultimate measure of the upper voice can be:

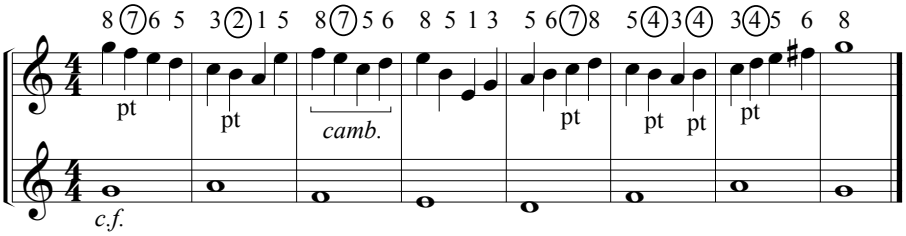
      i. $\hat{4}$–$\hat{5}$–$\hat{6}$–$\hat{7}$, or

      ii. $\hat{2}$–$\hat{1}$–$\hat{6}$–$\hat{7}$ (the *cambiata*—see 5.b. below)

   (b) If the *cantus firmus* is in the upper part, the penultimate measure of the lower voice is $\hat{7}$–$\hat{5}$–$\hat{6}$–$\hat{7}$.



3. Each downbeat should be a consonance.
4. When crossing barlines, apply the following:
   (a) "Imperfect" consonances (3rds and 6ths) can be approached in any manner.
   (b) "Perfect" consonances (unisons, 5ths, 8ves, 12ths) may only be approached in contrary motion in order to avoid direct 5ths and direct 8ves.
   (c) Do not repeat notes across barlines
5. Allowable dissonances:
   (a) Passing tones are allowable dissonances (but never on the first beat of the measure).
   (b) The *cambiata* (see the melodic contour in third measure of the example below) is allowed but only with the second note of the measure as the only dissonant interval.
6. Direct 5ths and direct 8ves are not allowed and occur when an 8ve or 5th on a downbeat is approached through similar motion.



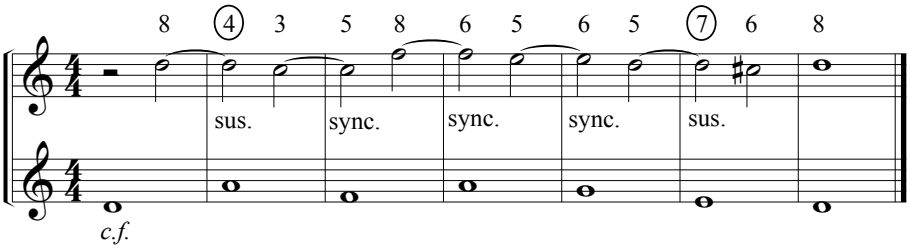
Go to Third Species Practice Exercises.

30.5 Fourth Species Counterpoint

Fourth species deals with writing suspensions (and syncopations). Because this is only a brief introduction to species counterpoint, you will only encounter the cantus firmus in the lower voice in fourth species in this text. See the fourth species rules below.

1. Start with a half rest, then write a half note an 8ve above the *cantus firmus*. The half note on the 3rd beat of every measure but the penultimate one ties across the barline to a half note on the first beat of the succeeding measure.
2. End on a whole note at the interval of an 8ve above the *cantus firmus*.
3. The penultimate measure should contain a 7-6 suspension.
4. The half note on the third beat of each measure is *always* a consonance.
5. If the half note after a tie is a dissonance (4th or 7th), it is a suspension and *must resolve down by step*.
   (a) Allowable suspensions in the upper part are 4-3 and 7-6; 9-8 and 2-1 are not allowed.

6. If the half note after the tie is a consonance (1, 3, 5, 6, 8), it is a syncopation and can be left in any manner (by step or leap in any direction).



Notice that all suspensions and syncopations are labeled and all dissonant intervals are circled.

Go to Fourth Species Practice Exercises.

30.6 Fifth Species Counterpoint

Fifth species (also know as "florid counterpoint") is a free mixture of first through fourth species. One can observe all species in the opening of Orlando di Lasso's *Expectatio Justorum*.

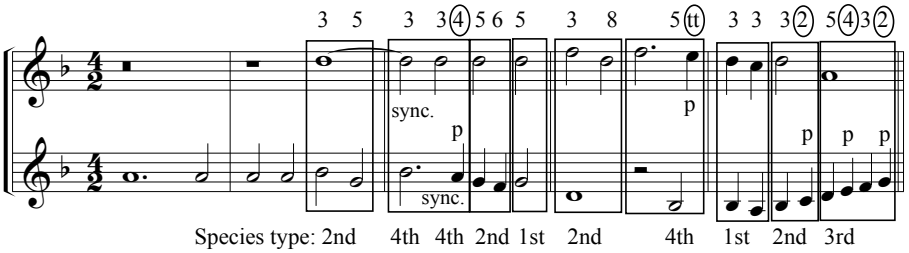


Figure 30.6.1 Orlando di Lasso, *Expectatio Justorum*

30.7 Invention Expositions

J.S. Bach's Two-Part Inventions were not only intended as instructional keyboard pieces but also as examples of how to compose. In this section we will wed our species counterpoint knowledge with our knowledge of harmony in order to write a four-measure invention exposition using Bach's C major and E minor inventions as models. Note the I–I–V–V–I harmonic progression.

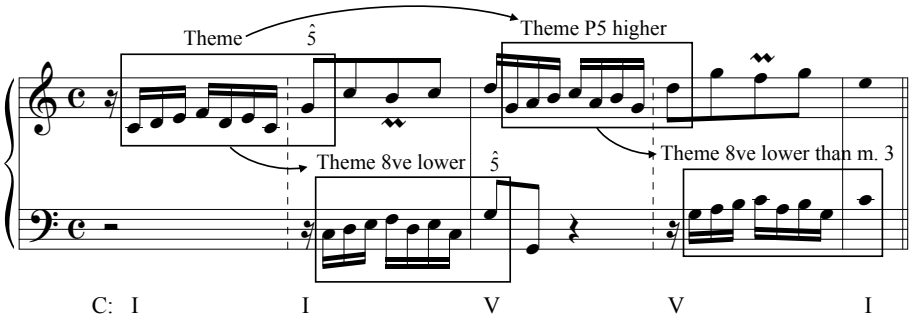


Figure 30.7.1 Bach, Invention No. 1 in C Major, BWV 772

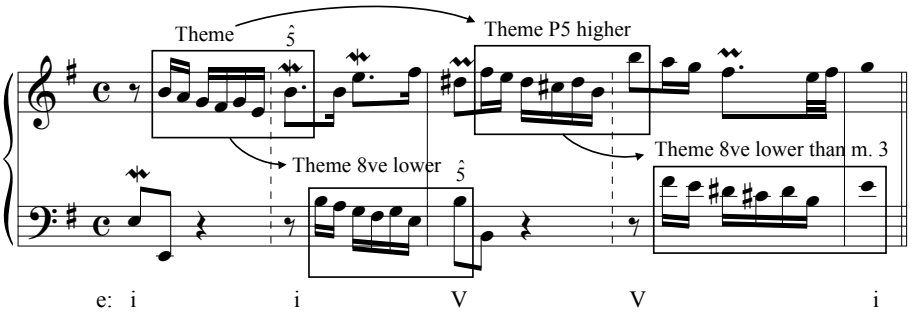


Figure 30.7.2 Bach, Invention No. 7 in E Minor, BWV 778

30.7.1 How to Write an Invention Exposition

In the majority of examples, you will be given an invention theme in the first measure, which you will write an octave lower in the bass part in the second measure, then a perfect fifth higher than the first measure in the third measure, the fourth measure will be the third measure transposed down one octave, and, finally, you will end on the interval of a 10th—tonic in the bass part and $\hat{3}$ in the upper part. Please see the example below.

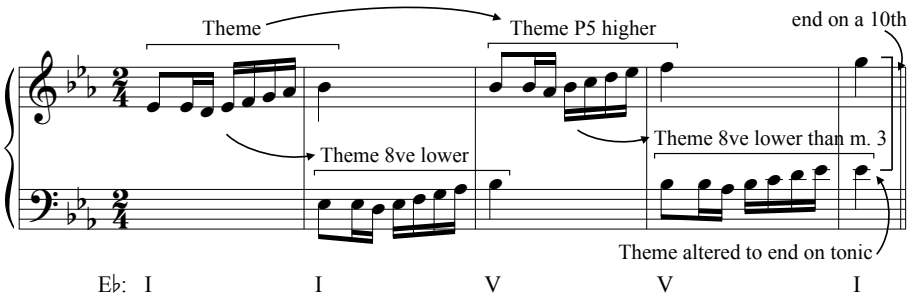
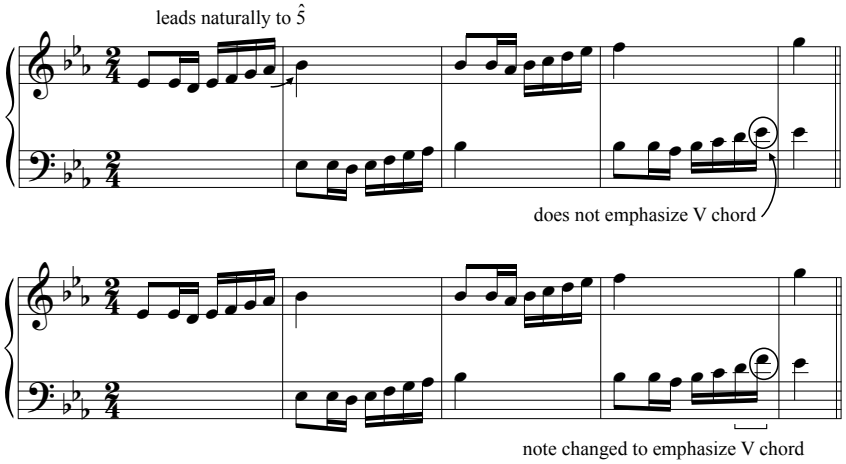


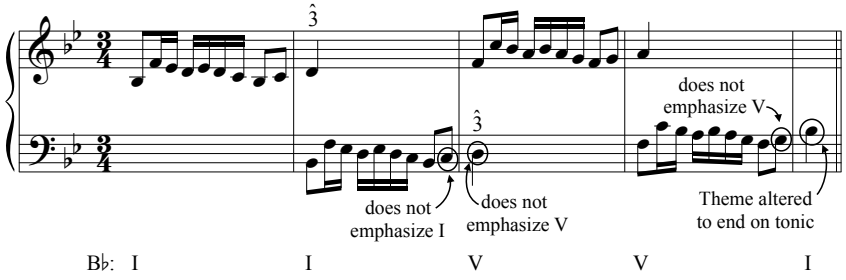
Figure 30.7.3

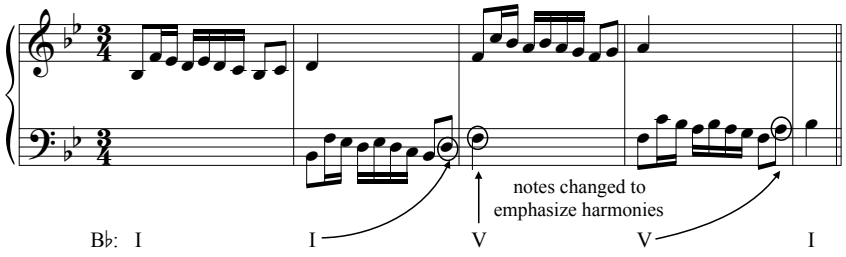
30.7.2 Altering Themes to Fit the Harmonies

1. You may find that a theme that leads naturally from I to V needs its contour altered *when progressing from V to I in measures 4 to 5* in order to emphasize the V chord and the dominant-to-tonic harmonic motion. Modify the contour to emphasize the V chord at the end of the measure, altering as few notes as possible.

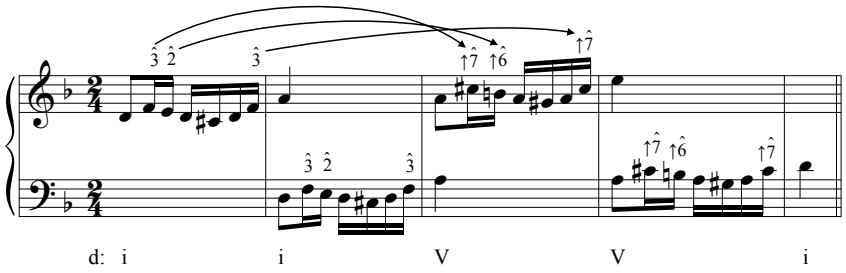


2. Additionally, you may be given themes that land on $\hat{3}$ on the downbeat of the second measure, not the $\hat{5}$ that occurred in the Bach C major and E minor invention expositions. You will need to alter the theme at the end of measure 2 to emphasize the I chord as well as make the first bass note of the third measure the $\hat{5}$ scale degree.



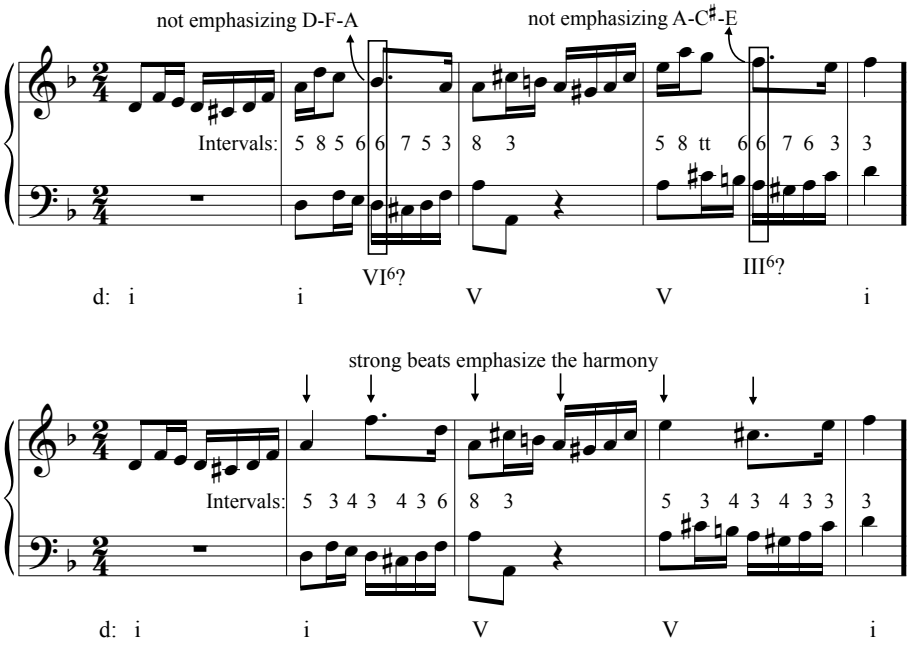


3. Finally, when a theme in minor containing the $\hat{2}$ and $\hat{3}$ scale degrees in the first two measures is transposed up a fifth in the succeeding two measures, scale degrees $\hat{2}$ and $\flat\hat{3}$ *will be transposed to* $\uparrow\hat{6}$ *and* $\uparrow\hat{7}$. The reasoning is that $\uparrow\hat{7}$ is the 3rd of the V chord, and $\uparrow\hat{6}$ is a step below, typically a passing tone. Another way to think of this is to *use the melodic minor scale in the 3rd and 4th measures.*



30.7.3 Adding Counterpoint to the Theme Statements

After copying and transposing the theme throughout this four-measure invention exposition, you will need to add counterpoint to accompany the statements of the theme in the second, third, and fourth measures. Unlike species counterpoint, your counterpoint in these invention expositions *must emphasize the harmony* in each measure.



You may find the need to create "microharmonies" within a measure with some themes, such as a I–IV–I or I–vii$^{\circ 6}$–I progression even though the overriding harmony of the bar is the I chord. Examples are found in the first two measures of the C major invention.

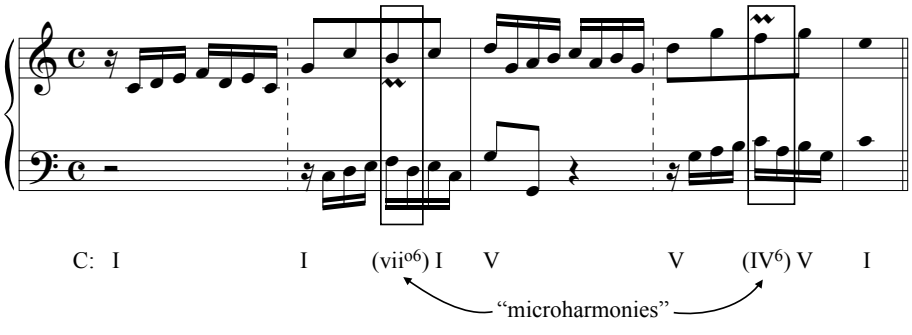


Figure 30.7.4 Microharmonies in the C Major Invention by J.S. Bach

Given these pieces of information, you are prepared to begin writing tonal counterpoint in two parts.

Go to the Invention Exposition Practice Exercises.

30.8 Fugue Analysis

We will now turn to analysis of fugue. Let us set out definitions first.

- A **fugue** is a contrapuntal composition whose form features sections called expositions and episodes.
- A fugue **exposition** is a section that contains at least one full statement of the subject of the fugue.[1]
- The fugue **subject** is the primary melodic idea and is stated by each voice in turn in the first exposition.
- The **answer**, called "response" in some texts, refers to the statement of subject in the key of the dominant by the second voice to enter in a fugue. Sometimes this statement of the answer has intervals altered in order to start in the tonic before modulating to the dominant. When the intervals

[1] Some authors reserve the term "exposition" solely for the first exposition and use the term "middle entry" for later statements of the full subject. *Grove Music Online* includes the following in their definition of "Exposition": "...In German the word *Durchführung* is used to refer to all groups of thematic entries in the body of the fugue, after the opening *Exposition*. Because there is no equivalent word so used in English, English speakers sometimes, but by no means universally, apply the word 'exposition' to these later thematic groups as well."

are altered in this manner, we call this a "tonal answer." In contrast, a "real answer" contains no alteration of intervals. In the example below, notice that the third note of the subject in measure 1 descends a perfect fourth to the fourth note. In the answer in measure 3, the third note descends a perfect fifth to the fourth note.

- An **episode** is a section that does not contain a full statement of the fugue subject, but instead develops the subject or other prominent ideas through fragmentation and sequencing.

Here is the first exposition of Fugue 2 in C minor in Book I of the J.S. Bach's *Well-Tempered Clavier*. In the first exposition of a fugue, all of the voices state the subject at least once. It is important to note that a answer is considered equivalent to a subject because the intervallic alterations are so minute.

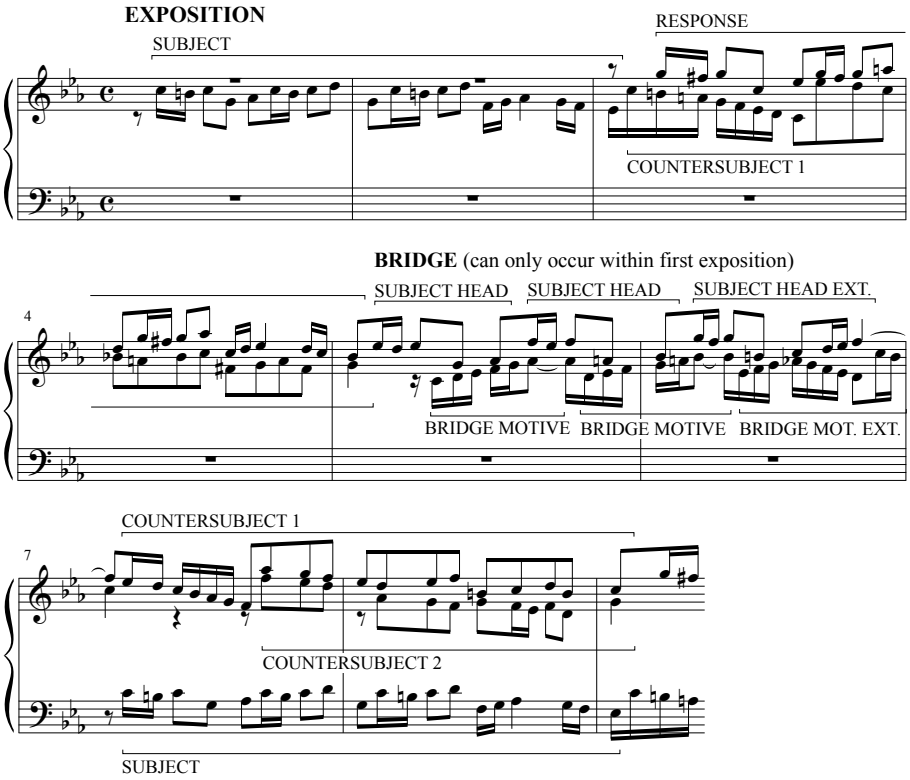


Figure 30.8.1 First Exposition of Fugue 2 in C minor from *WellTempered Clavier*, Book I (BWV 847)

- The **bridge**, if it occurs, is a brief modulatory passage that only happens *within* the first exposition, usually to connect the answer to the subsequent subject statement.

- A **countersubject** is counterpoint that consistently accompanies each occurrence of the subject. "Countersubject 1" is in the alto voice in measure 3 and in the soprano voice in measure 7. The alternative to using a countersubject would be for a composer to write different accompanying counterpoint (labeled as "CTRPT" in the examples) each time a subject is stated.

Within the bridge (bar 5 in the example above), we see motivic fragmentation of the subject ("subject head"). Subjects, answers, and countersubjects can be fragmented into head motives and tail motives in episodes in fugues. In this fugue, there is motivic fragmentation of the subject, countersubject 1, and countersubject 2.

Below is the first episode, which contains motivic fragmentation of the subject and countersubject 1.

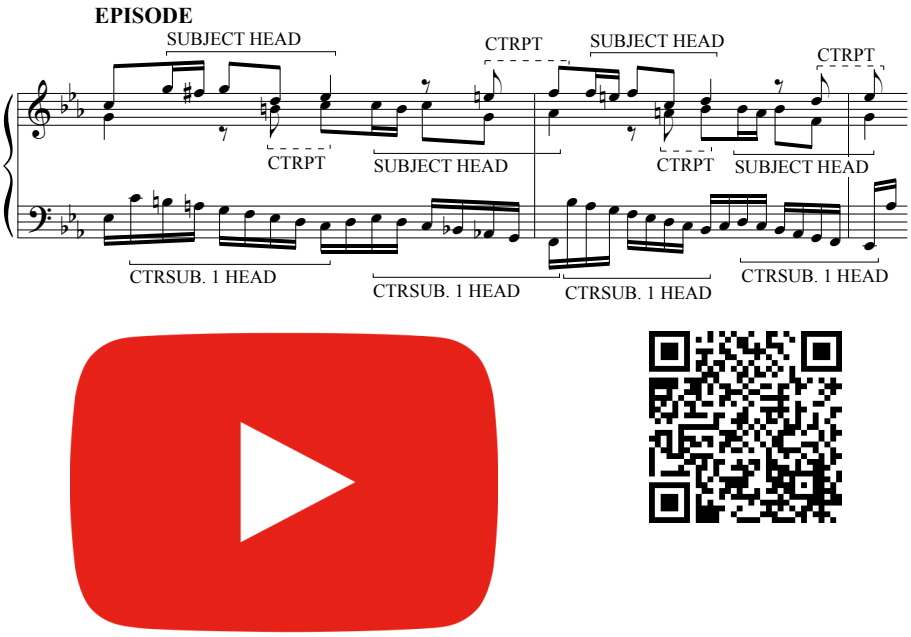
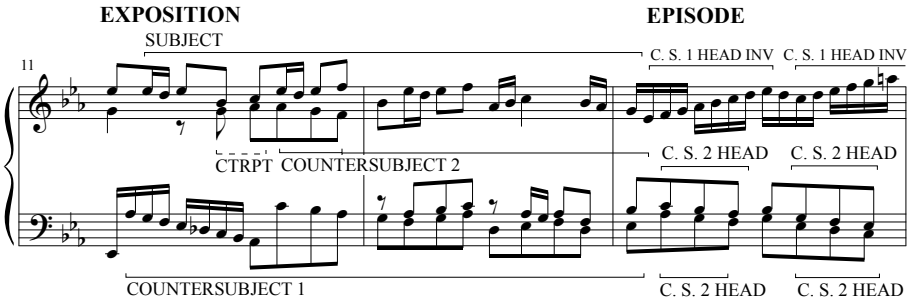


Figure 30.8.2 First Episode of Fugue 2 in C minor from *WellTempered Clavier*, Book I (BWV 847)

Below are the second exposition, the second episode, the third exposition, and the third episode.



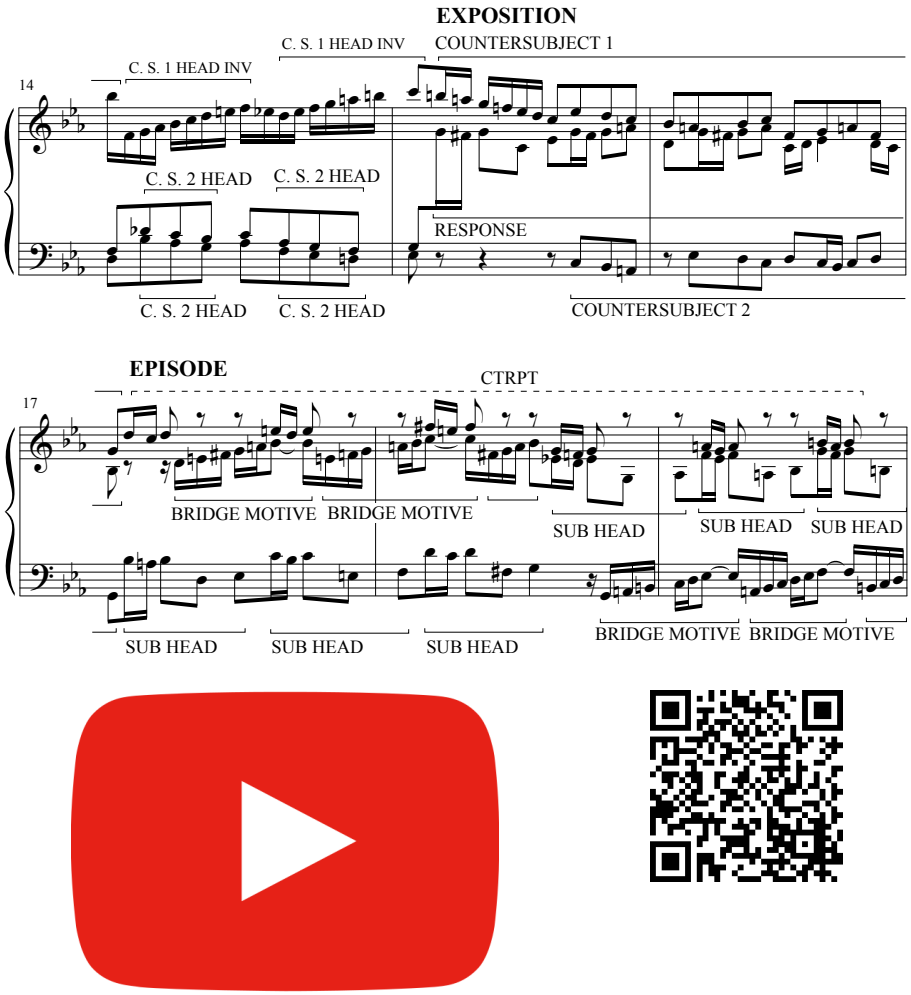
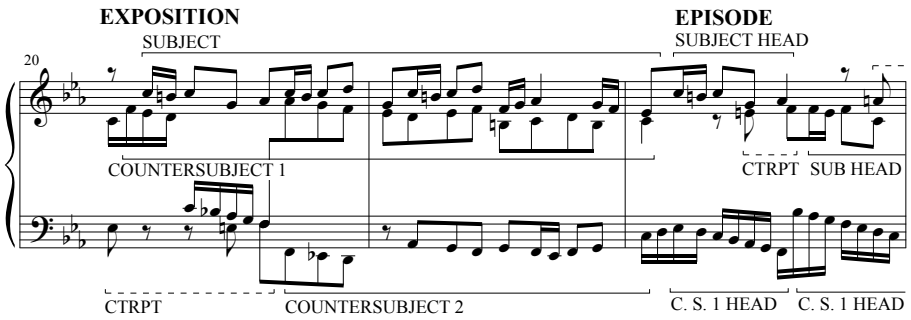


Figure 30.8.3 J.S. Bach, Fugue 2 in C minor from *WellTempered Clavier*, Book I (BWV 847)

In the four systems below, we see the fourth exposition, fourth episode, and final exposition, which includes two subject statements separated by cadential material.



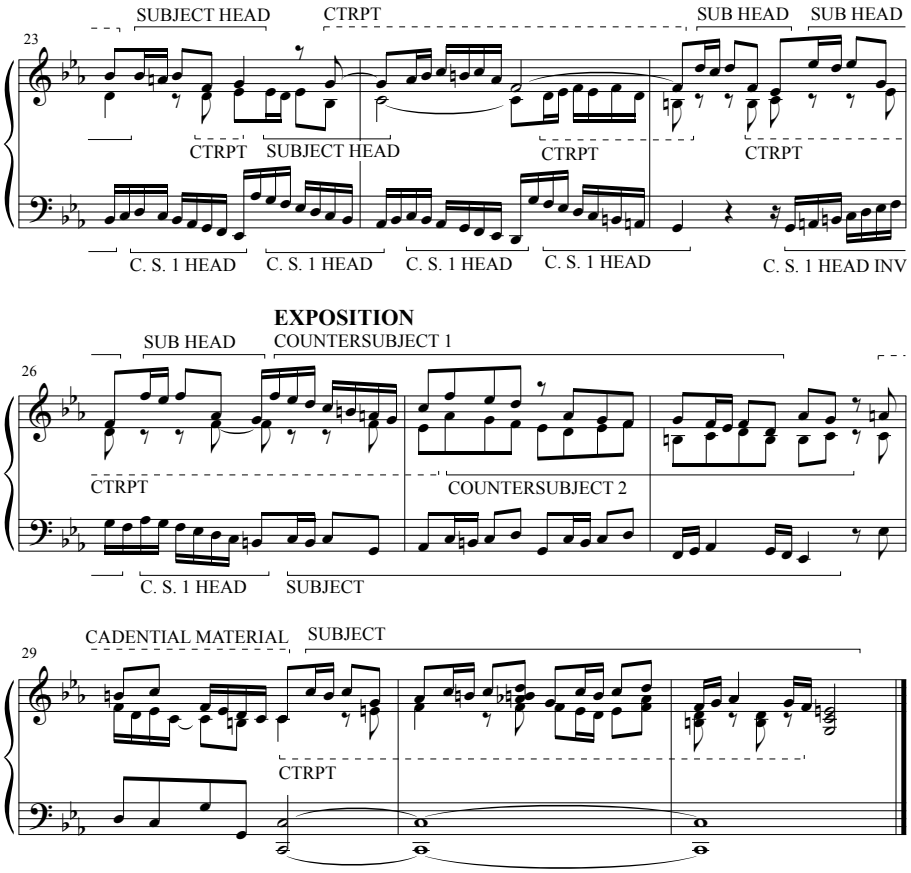


Figure 30.8.4 J.S. Bach, Fugue 2 in C minor from *WellTempered Clavier*, Book I (BWV 847)

In homework and on the test, you will be asked to analyze a fugue with regard to expositions (including the bridge, if it occurs), episodes, subjects, answers, countersubjects, and motivic fragmentation.

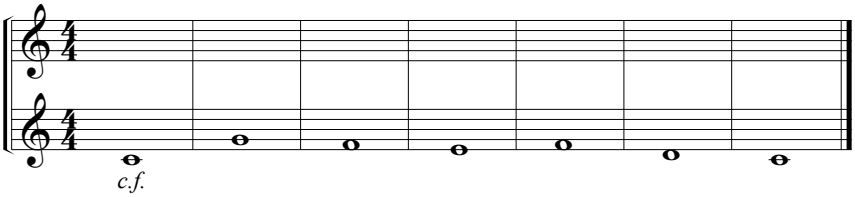
30.9 Practice Exercises

Species Counterpoint: Day One

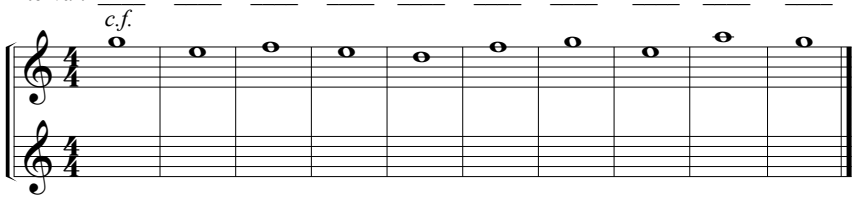
First and Second Species Exercises

1. For each exercise below, write first species (note-against-note) counterpoint. Write the intervallic distance from the cantus firmus ("*c.f.*") to the counterpoint in the blanks above the staff. Remember to begin and end with an octave or unison, to proceed to the last unison by step in both voices, and use only consonances (1, 3, 5, 6, 8, 10).

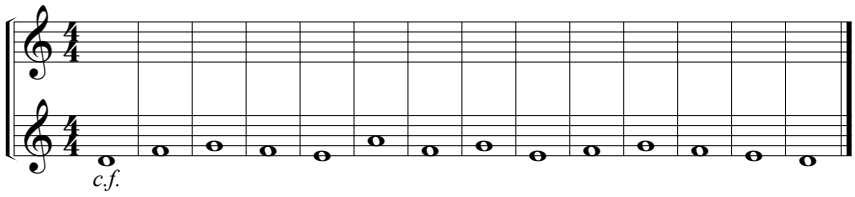
Interval: ___ ___ ___ ___ ___ ___ ___



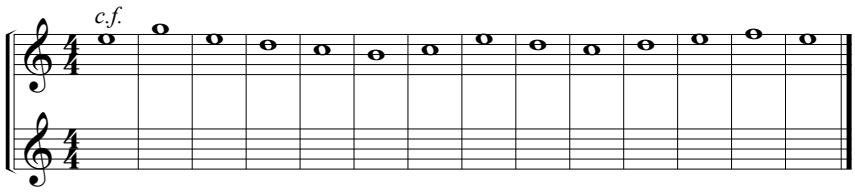
Interval: ___ ___ ___ ___ ___ ___ ___ ___ ___ ___



Int: ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___

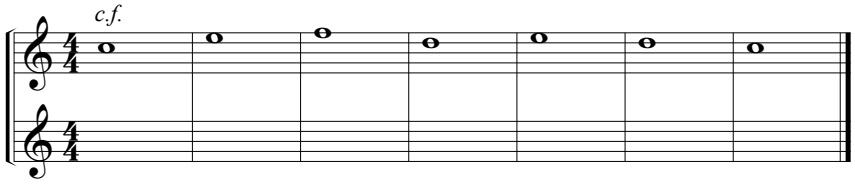


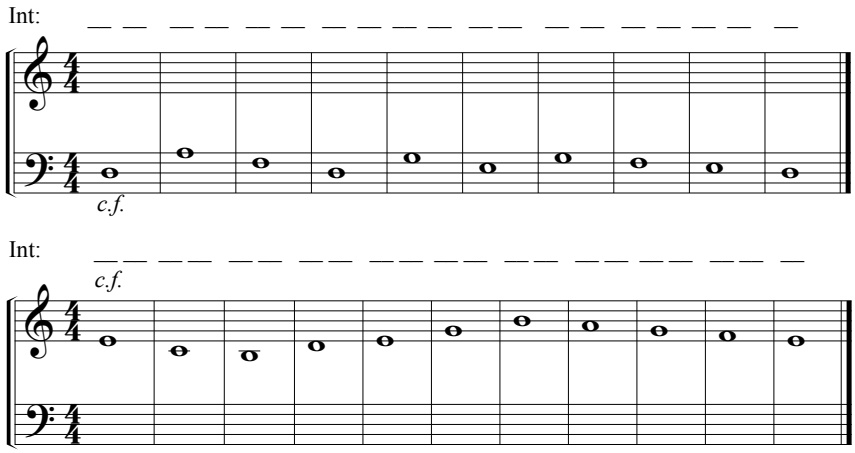
Int: ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___



2. For the exercises below, write second species counterpoint—two half notes in each measure except the last. Each downbeat must be a consonance. The only dissonance allowed is the passing tone. Write the intervallic distance from the *cantus firmus* ("*c.f.*") to the counterpoint in the blanks above the staff. Circle all dissonant numbers (2, 4, and 7) and label passing tones with "pt."

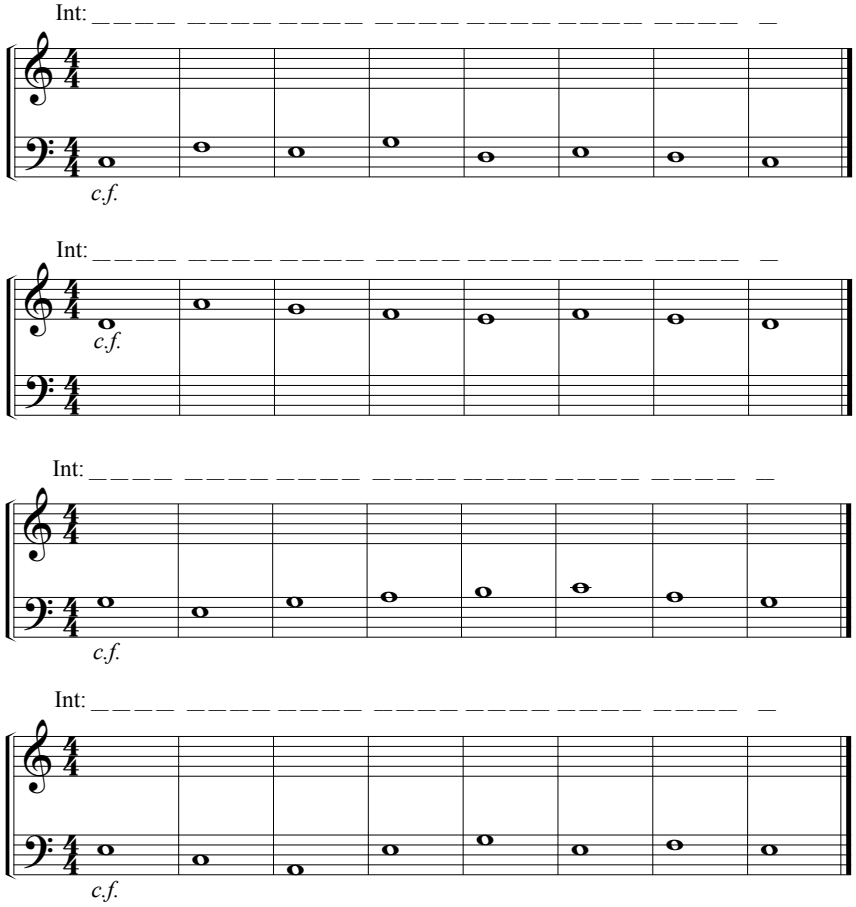
Int: ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___ ___



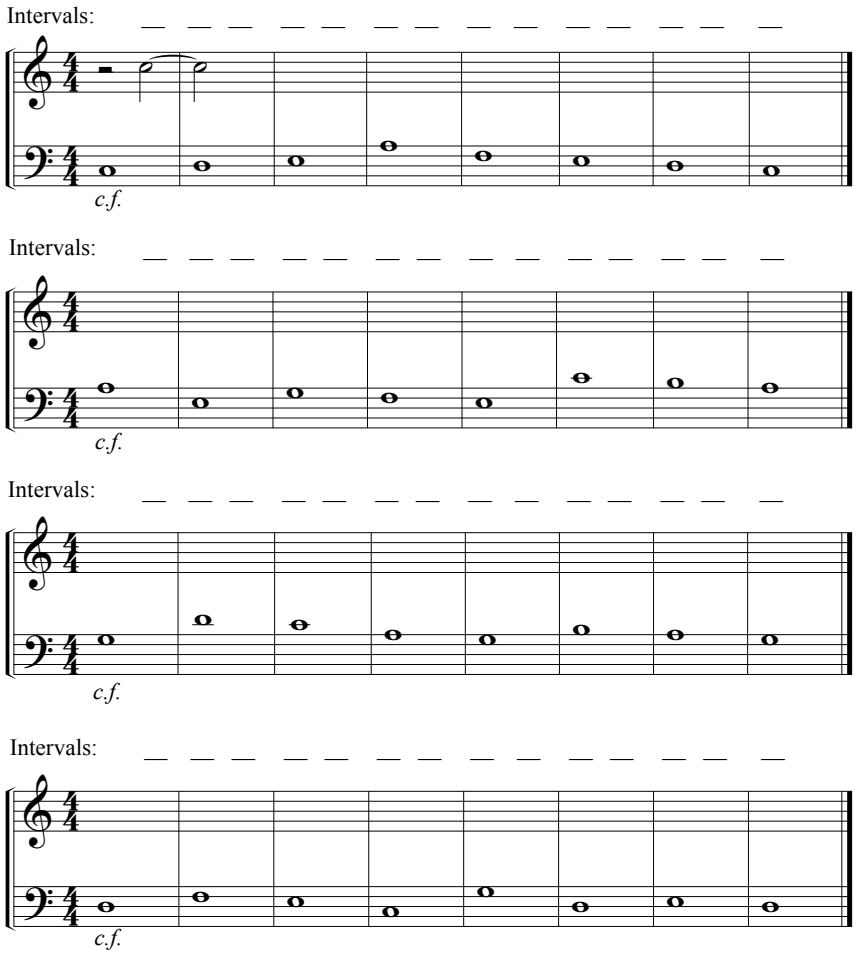


Species Counterpoint: Day Two

3. For each exercise below, write third species counterpoint (quarter notes). Circle all dissonant interval numbers and label passing tones and cambiata figures.

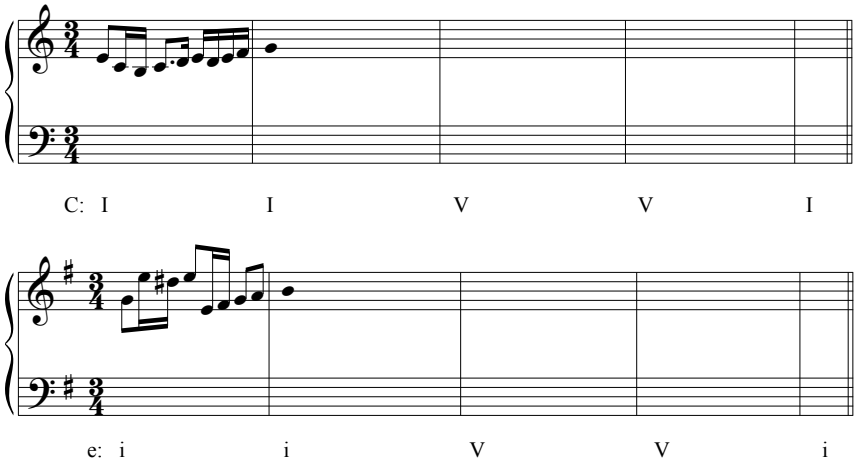


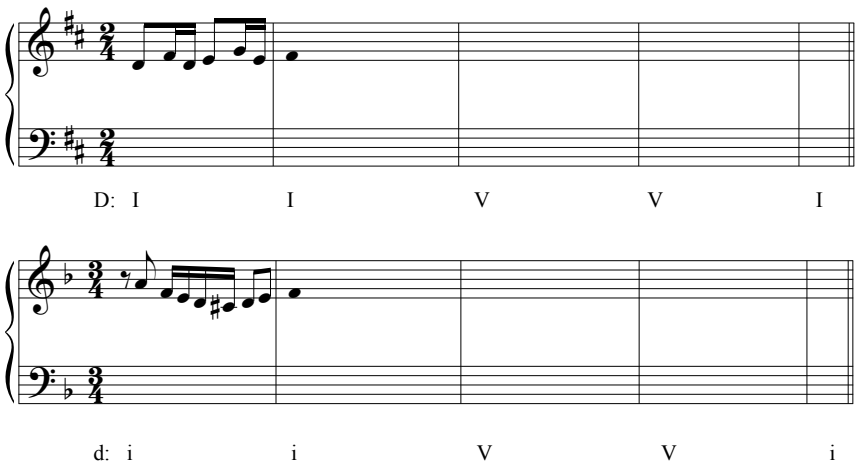
4. For each exercise below, write fourth species counterpoint (suspensions and syncopations). Circle all dissonant interval numbers and label suspensions with "sus" and syncopations with "sync."



Invention Expositions

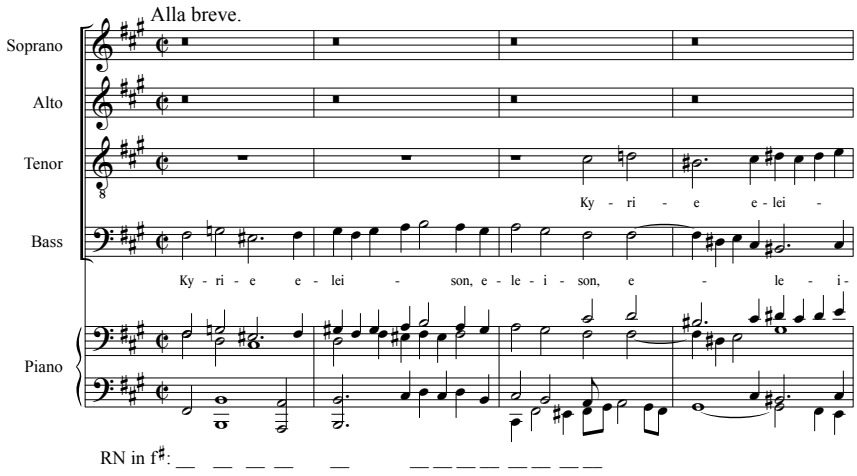
5. Complete these invention expositions by following the I–I–V–V–I harmonic pattern and transposing and modifying the theme accordingly.

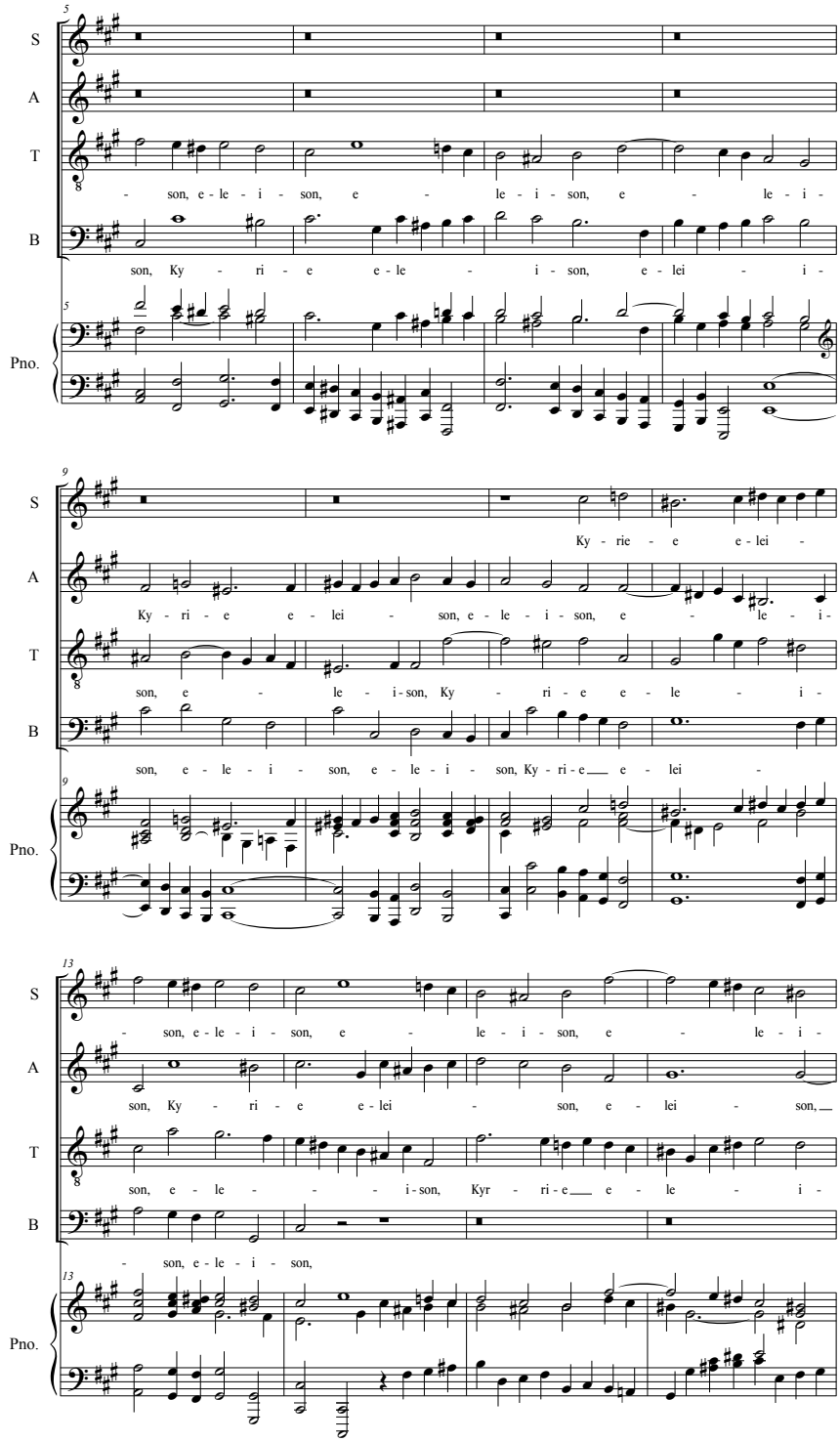




Fugue Analysis

6. For this fugue from the second *Kyrie eleison* of Bach's *Mass in B Minor* (BWV 232), specify formal sections (expositions and episodes), motives (subject, answer, countersubjects, and fragments thereof), and key areas for expositions only in the table below. This fugue contains more "counterpoint" (material not derived for subjects or countersubjects) than the C minor fugue in the body of the text.




5
S
A
T
B
Pno.
- son, e - le - i - son, e - le - i - son, e - le - i -
son, Ky - ri - e e - le - i - son, e - lei - i -
9
Ky - rie - e e - lei -
Ky - ri - e e - lei - son, e - le - i - son, e - le - i -
son, e - le - i - son, Ky - ri - e e - le - i -
son, e - le - i - son, e - le - i - son, Ky - ri - e e - lei -
13
- son, e - le - i - son, e - le - i - son, e - le - i -
son, Ky - ri - e e - lei - son, e - lei - son,
son, e - le - i - son, Kyr - ri - e e - le - i -
- son, e - le - i - son,

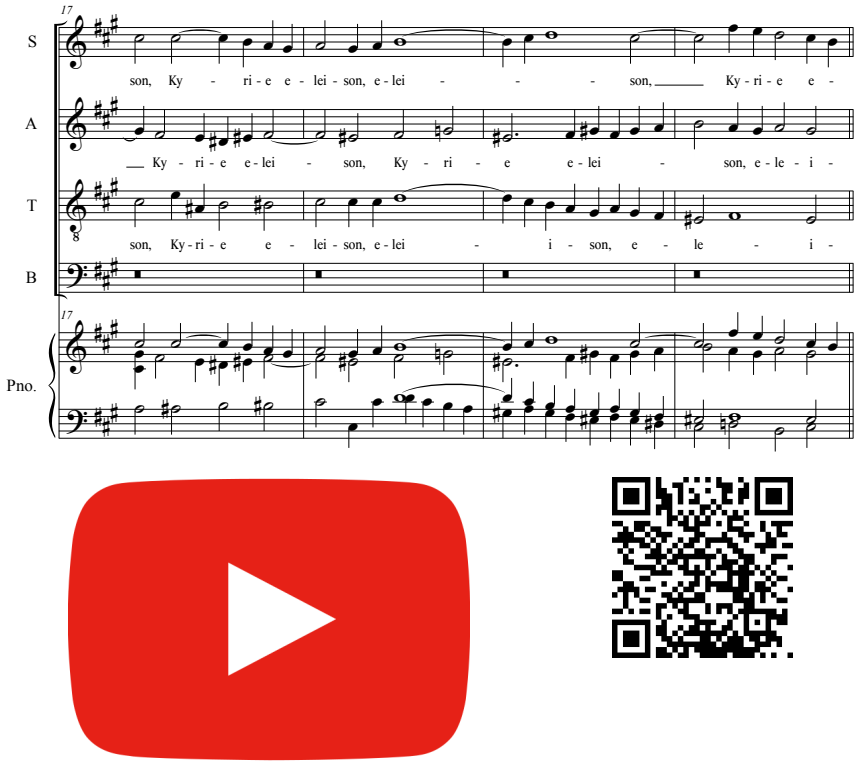


Figure 30.9.1 J.S. Bach, *Mass in B Minor*, BWV 232, Kyrie eleison II

Table 30.9.2 *Mass in B Minor*: Fugue Analysis Table

FORM				
SOPRANO				
ALTO				
TENOR				
BASS				
KEY				
Meas.	1	2	3	4

FORM				
SOPRANO				
ALTO				
TENOR				
BASS				
KEY				
Meas.	5	6	7	8

FORM				
SOPRANO				
ALTO				
TENOR				
BASS				
KEY				
Meas.	9	10	11	12

FORM				
SOPRANO				
ALTO				
TENOR				
BASS				
KEY				
Meas.	13	14	15	16

FORM				
SOPRANO				
ALTO				
TENOR				
BASS				
KEY	_____ _____	_____ _____	_____ _____	_____ _____
Meas.	17	18	19	20

Click here to download the first homework assignment for this chapter.
Click here to download the second homework assignment for this chapter.
Click here to download the third homework assignment for this chapter.
Click here to download the fourth homework assignment for this chapter.
Click here to download the fifth homework assignment for this chapter.
Click here to download the Unit 10 Practice Test.

PDF versions of the textbook, homework exercises, and practice exercises can be found at musictheory.pugetsound.edu

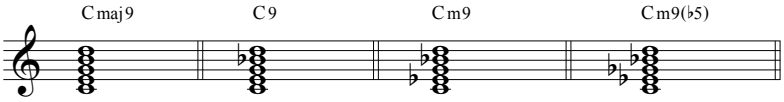
Chapter 31

Introduction to Jazz Theory

This introduction to jazz theory focuses on the types of chords encountered in jazz, how these chords might be voiced, how to voice lead these chords in five-part harmony, and scales associated with these chords.

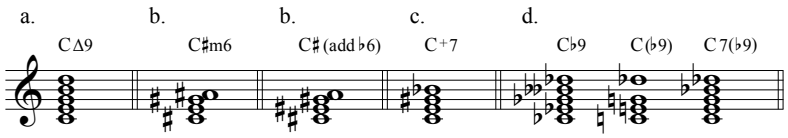
31.1 Jazz Chord Basics

1. **Ninth chords** are common in jazz.
   (a) Four of the five common seventh chord types in classical and popular music will have ninths added to them; the exception is the fully diminished seventh chord.
      i. The $^{\emptyset 7}$ chord is also labeled as $\mathrm{m}^{7}(\flat 5)$ in jazz—$\mathrm{C}^{\emptyset 7}$ is the same as $\mathrm{Cm}^{7}(\flat 5)$.
   (b) In lead-sheet notation, *adding "9" to a chord symbol means the 7th is also present.*
   (c) "9" is "2" an octave higher and always comes from the major scale unless otherwise specified.



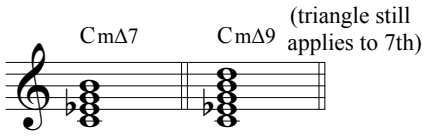
2. Alterations (maj, Δ, $\sharp$, $\flat$, +, m, –) are applied as follows:
   (a) "maj" or "Δ" followed by 7, 9, 11, or 13 means the 7th of the chord is major, not the 9th, 11th, or 13th.
   (b) Lowercase "m" or the minus sign ("–") means minor and applies to the 3rd of the chord.
      i. The minus sign (–) is equivalent to a flat when placed in front of 9, 11, or 13 (i.e., $\flat$9 and –9 mean the same thing). "$\mathrm{C}^{\sharp}{}_{-6}$" (equivalent to "$\mathrm{C}^{\sharp}\mathrm{m}^{6}$") means a $\mathrm{C}^{\sharp}$ minor chord ("$\mathrm{C}^{\sharp}{}_{-}$") with the 6th from major (A$\sharp$). "$\mathrm{C}^{\sharp}$ (add –6)," which is equivalent to "$\mathrm{C}^{\sharp}$ (add $\flat$6)," means a C$\sharp$ major triad with the $\flat$6 added
   (c) The plus sign (+) can mean "augmented triad" or is equivalent to a sharp when placed in front of 9, 11, or 13. C+7 means a C augmented triad ("C+") with a minor seventh from the root to the seventh("7"), not a C major triad with a major 7th.

(d) Chromatically altered chord numbers (affecting 6, 9, 11, 13) are usually set apart by parentheses so as to clearly designate whether the minus, plus, or sharp, or flat is affecting the chord or the added note. For example, consider C♭9 versus C(♭9) versus C7(♭9).



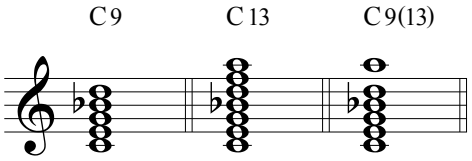
3. If a chord has a 9th but no 7th, use the term "add 9." In popular music, sometimes "2" or "add 2" is used instead (refer to the Chord Labels section).

4. m Δ 7 Chord: In addition to the five common seventh chord types, jazz includes use of the minor-major seventh chord (a minor triad with a major seventh). This chord will commonly have a ninth added as well. You will see the "major" symbol (Δ) used primarily in jazz. Popular music typically uses "maj" instead.



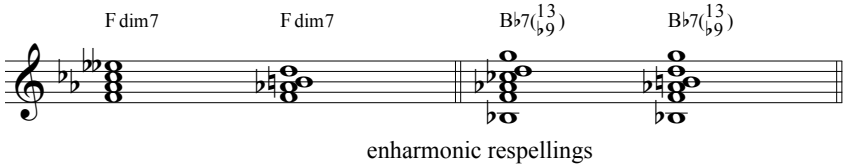
5. **11th** and **13th** Chords: 11ths and 13ths always come from the major scale unless otherwise specified. ("11" is "4" an octave higher and "13" is "6" an octave higher.)

   (a) All numbers up to the highest number are assumed. C9 means that the 7th is also included below the 9th. C13 means C–E–G–B♭–D–F–A—everything up to the 13th. For this reason, we will use C9(13)—to specify C–E–G–B♭–D–A—instead of C13, which would be used in the real world to describe these notes. In the real world, a composer or arranger writing C13 will assume the pianist or guitarist knows to omit the unaltered 11th because it clashes with the major 3rd of the chord. In this music theory course we will be specific as to which notes are included and left out.



6. $\frac{6}{9}$ chords: If a chord has a 6th and a 9th, call it a $\frac{6}{9}$ chord (C $\frac{6}{9}$) instead of a $\frac{9}{6}$ chord. The major $\frac{6}{9}$ uses the major third (C–E–G–A–D) while the minor $\frac{6}{9}$ uses the minor third (C–E♭–G–A–D). The "6" always comes from the major scale unless otherwise specified. (Refer to the Chord Labels section for examples.)

7. Enharmonic respelling: Jazz musicians will sometimes respell double-flatted notes and double-sharped notes enharmonically because for some musicians theory was viewed more from the aspect of the piano than the staff. This may at times include enharmonically respelling notes like B♯, C♭, E♯, and F♭ (although these notes sometimes will be used).



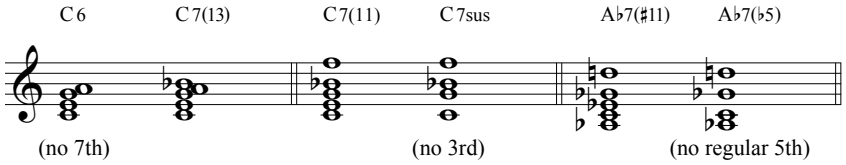
8. For the purposes of this text, we will assume the bass note is the root when analyzing chords. While slash chords (E/C, for example) are used in jazz, this chapter is meant as an introduction to the fundamentals of jazz harmony and therefore will not include the use of slash chords.

31.2 Chord Symbol Specifics

1. "6" versus "13" rule: label the 6th of a chord "6" only if the 7th is not present; if the 7th is present, label the 6th as "13"

2. "11" versus "sus" ("sus" means "4"): label the 4th of a chord "sus" only if the 3rd is not present; if the 3rd is present, label the 4th an "11" (C7sus has C–F–G–B♭). (There is an exception to this in more advanced jazz theory, which is not within the purview of this text.)

3. ♭5 versus ♯11: If the chord has a normal 5th (C–E–G–B♭–F♯), call the F♯ a "♯11" (because you won't have a chord with a regular and altered 5th at the same time). Otherwise, you can call the F♯ of C–E–B♭–F♯ a "♯11" or a "♭5."



31.3 Altered Dominant Seventh Chords

Typically, a dominant seventh chord is considered **altered** if either or both the 5th or 9th are chromatically raised or lowered. ("G7alt" might mean a G7 with both an altered 5th and 9th, but is vague in that it doesn't specify how the 5th and 9th are chromatically altered.)

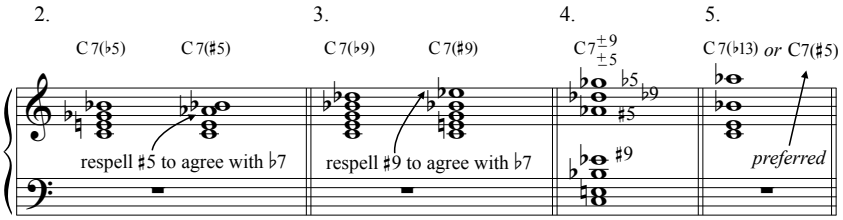
1. Root, 3rd, and 7th of dominant seventh chord remain unchanged.

2. 5th may be raised or lowered (♯5 or ♭5, which can also be written with pluses and minuses as +5 or –5) and can be respelled enharmonically (the ♯5 of a C7♯5 could be written as an A♭ instead of G♯) for ease of reading because the chromatic spelling agrees with B♭ (the 7th of the chord)—it is easier to read a chord where the accidentals agree (all sharps or all flats).

3. 9th may be raised or lowered (♯9 or ♭9, which can also be written in the lead-sheet symbol as +9 or –9). The ♯9 is often spelled enharmonically on the staff as ♭10 for ease of reading; therefore, a dominant seventh chord with a ♯9 will appear to have both a major and minor 3rd (C–E–G–B♭–E♭). You may be tempted to call such a chord a minor chord with a ♭11, but ♭11 is not used because it is the major third of a chord.

4. Both alterations of 5 and 9 may occur simultaneously (±9/±5).

5. ♭13 is the enharmonic equivalent of the ♯5. In this text, ♯5 is preferred to ♭13, but you will see both on lead sheets. Also, ♭13 implies that the unaltered 5th occurs in the chord, while ♯5 does not.



If you are composing or arranging and want to know when to use altered chords, know that dominant sevenths are usually altered (with altered 5th or 9th or both) when they have dominant function (i.e., when the root is going to resolve down by a fifth). Dominant sevenths are often unaltered when they have tonic function, i.e., the first chord in a blues.

31.4 Chord Labels

The following list of chords is edited and condensed from *The New Real Book* (Vol. 1), published by Sher Music Co.

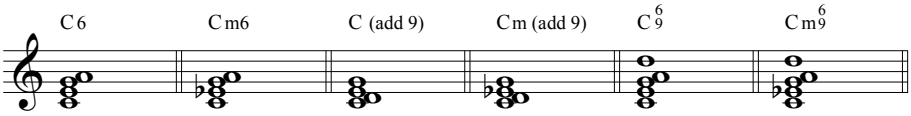


Figure 31.4.1 Triads with added notes

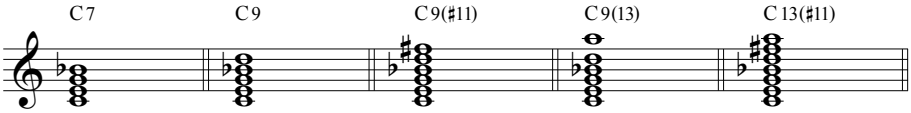


Figure 31.4.2 Dominant seventh chords

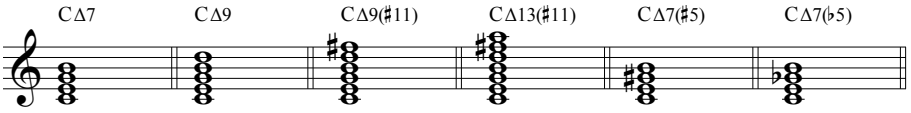


Figure 31.4.3 Major seventh chords

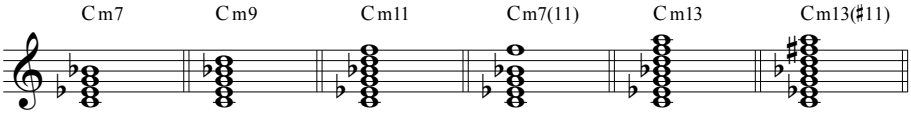


Figure 31.4.4 Minor seventh chords

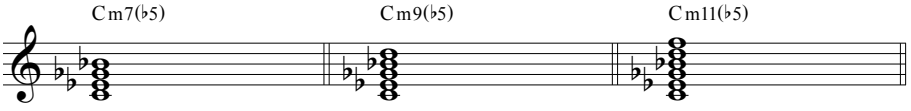


Figure 31.4.5 Half-diminished seventh chords

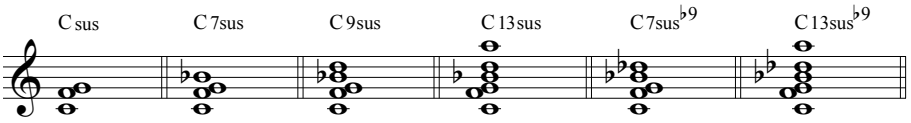


Figure 31.4.6 Sus chords

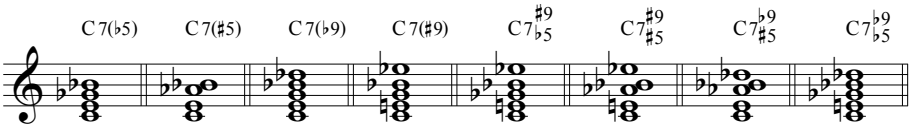


Figure 31.4.7 Altered chords

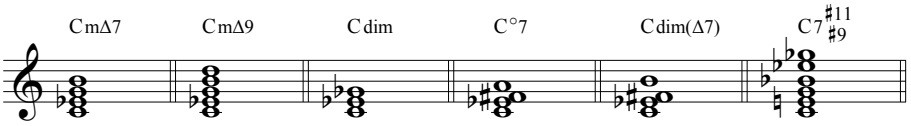


Figure 31.4.8 Other chords

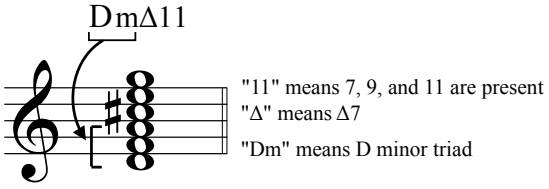
One finds that almost any combination of triad or seventh chord plus any alteration or combination of alterations is possible.

31.5 How to Write Jazz Chords

To write a jazz chord after being given a lead-sheet symbol, begin with all of the major notes up to the 13th.

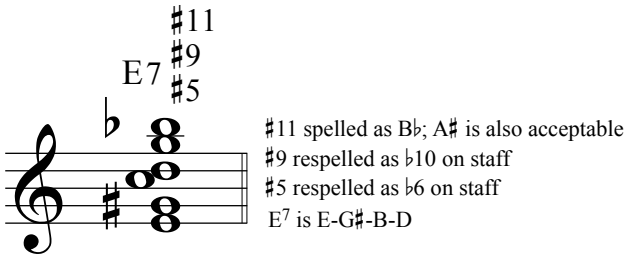
Let's work through this with the following label: Dm Δ 11.

Dm means D–F–A. The Δ 11 means there is a major 7th, regular 9th, and regular 11th, not that there is a major 11th. Remember, D11 would mean a D7 chord with the 9 and 11 (all chord members up to the 11th—D, F♯, A, C, E, G). D Δ 11 would mean a D Δ 7 chord with all members up to the 11 (D, F♯, A, C♯, E, G).



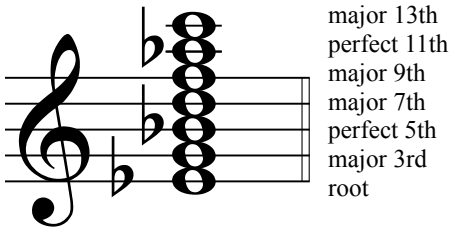
Let's try this with another chord: E7 $\begin{pmatrix} \sharp 11 \\ \sharp 9 \\ \sharp 5 \end{pmatrix}$.

E7 means we have E–G♯–B–D. When we look at the altered notes, we see ♯5, so we add a B♯, then change it to a C♮ because that agrees chromatically with the 7th, D. When we add ♯9, we add F𝄪, which looks overly complicated, so we enharmonically respell it as G♮, which agrees chromatically with the D (7th) and C (♯5). The ♯11 can be an A♯, an augmented 2nd above the G (the ♯9), or we can respell it as a B♭. Both A♯ and B♭ are acceptable, although the upper notes of D–G–B♭ form a G minor triad and therefore are easy to sightread.



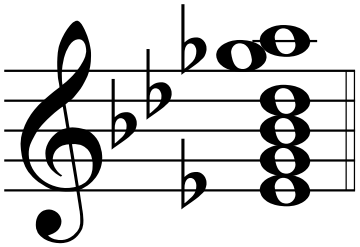
31.6 How to Analyze Jazz Chords

To analyze a jazz chord, on scratch paper write out all the *major* chord members up to the 13th. These include the major 3rd, perfect 5th, major 7th, major 9th, perfect 11th, and major 13th.

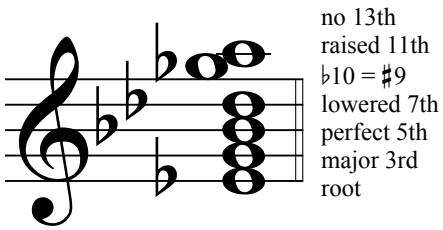


In order to analyze the following chord, determine the following:

1. The quality of the 7th chord
2. The upper structure (9, 11, and 13)
3. Any alterations to any of the chord members
4. If any of the notes are enharmonically respelled

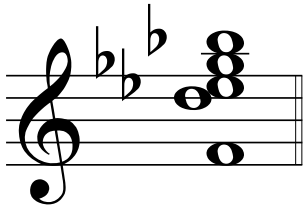


Work through each step (see the example below). Compare this chord to the scratch paper version with all the major notes up to the 13th. We have an E♭ dominant 7th chord. The G♭ can't be the minor third because we already have a G♮. If we consider the G♭ enharmonically as an F♯, we see we have a ♯9, which we noted earlier is often spelled as ♭10 so as to agree chromatically with the ♭7. The A is the 11th, but it is an A♮, so it is a ♯11. It is not ♭5 because we would not have both a perfect 5th and altered 5th in the same chord. There is no C in the chord, so there isn't a 13th.

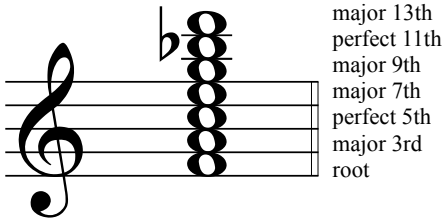


The final label is E♭7 $\left(\begin{smallmatrix}\sharp 11\\ \sharp 9\end{smallmatrix}\right)$.

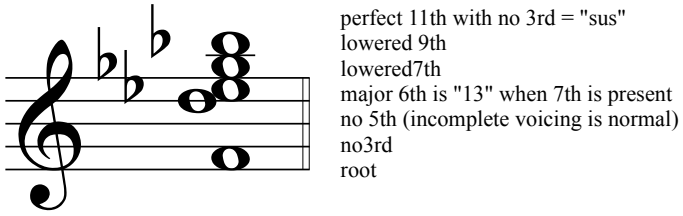
Let's try another chord.



Again, work through each step. First, write all the major notes up to the 13th.



Compare the "all major and perfect" 13th chord above to the chord to be solved.



We notice we don't have an A, and we remember that we might have a sus chord where the 4 (or sus4) substitutes for the 3rd. We see we have a B♭, which confirms this. We also do not see a C, but we remember that it is common to omit the 5th in a chord (see "incomplete chords" in Definition 7.4.12). Therefore we have F–B♭–E♭, making an F7sus chord. When we examine for upper structure notes (the 9, 11, and 13), we find a G♭ (the ♭9 of the chord) and a D (the 13). Remember, the B♭ is the sus (the 4th), not the 11th, because we have no 3rd (see "11 versus Sus" in Section 31.2).

The final label is F13sus(♭9).

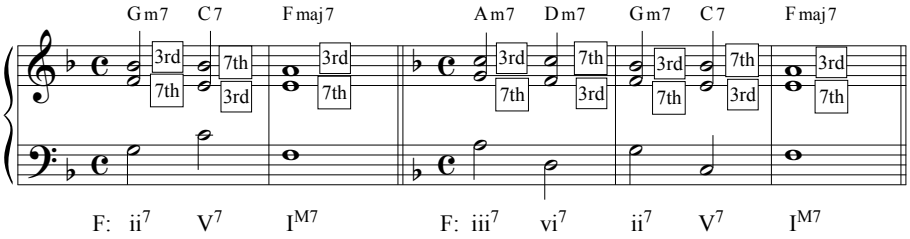
"F13" means we have root, 3rd, 5th, ♭7th, 9th, 11th, and 13th. "Sus" is a modifier that means we have the 4th, which eliminates the 3rd as well as the 11th because "sus" and 11 refer the same note (B♭). "♭9" means the 9th is lowered chromatically.

31.7 Jazz Chord Voicings

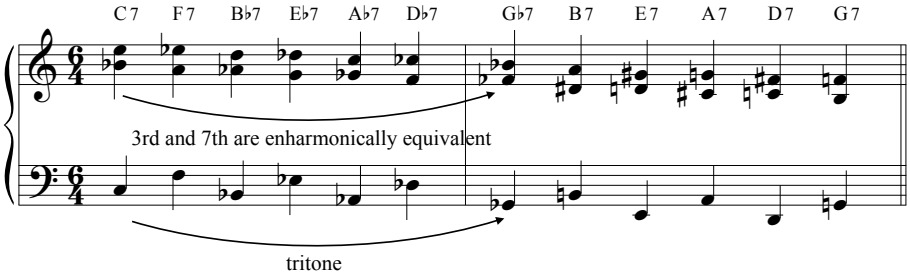
In this section we will define guide tones and learn about two types of jazz chord voicings.

31.7.1 Guide Tones

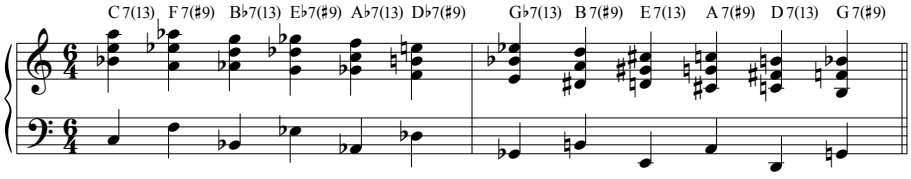
Guide Tones are the 3rd and 7th of a chord. In any circle of fifths progressions (including ii–V–I and iii–vi–ii–V) the guide tones move by step.



Play through the entire circle of fifths with dominant 7th chords (C7–F7–B♭7, etc.) with the bass note in the left hand and the guide tones (3rd and 7th) in the right hand and observe how the 3rd and 7th are the same for bass notes a tritone from each other.



Also, you can play through the circle of fifths alternating between 7(13) chords and 7(♯9) chords—C7(13)–F7(♯9)–B♭7(13)–E♭7(♯9)—with the right hand descending chromatically. This can be repeated with all of the bass notes a tritone away (starting on F♯ in the left hand) and the qualities are exchanged for all the chords.

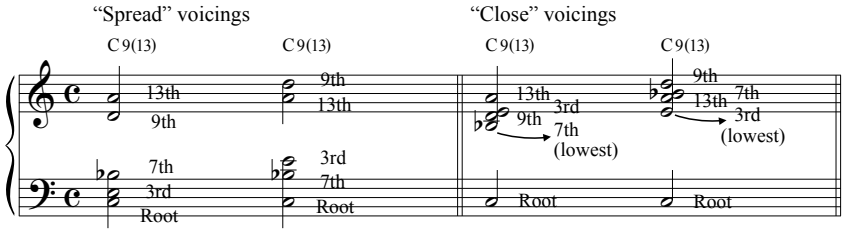


31.7.2 Jazz Chord Voicings

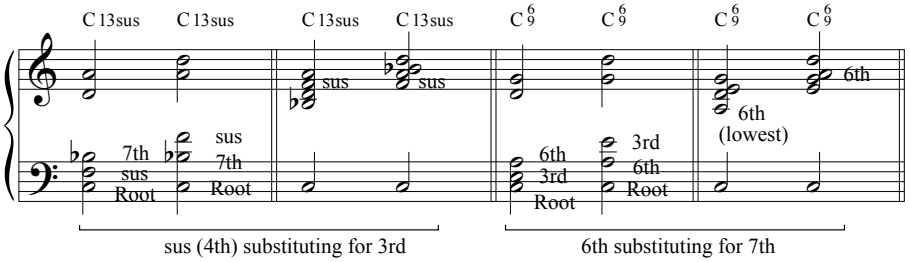
In this section we will examine two categories of voicings.

1. The first category ("spread" voicings) has 5-note chords with the root, 3rd, and 7th as the lowest notes with other chord members voiced above, often in the interval of a fourth or fifth. (The root will always be the lowest note, while the 3rd can be voiced above or below the 7th).

2. The second category ("close" voicings) has 5-note chords with the bass note in the left hand and the other four notes in "close position" in the right hand, usually with the 7th or 3rd of the chord as the lowest note in the right hand.



Some chords (like sus chords) do not have a 3rd, and some do not have or a 7th (like C^{6} or C^{6}_{9}). In those cases, voice the sus4 like you would the 3rd, and likewise voice the 6th as you would the 7th.



Sometimes you will need to omit the fifth to maintain five parts.

31.8 Standard Chord Progressions

In this section we will focus only on the ii–V–I progression and the iii–vi–ii–V progression. Both were already mentioned in Section 9.3.

31.8.1 II–V–I

The II–V–I is one of most common progressions in jazz, especially in tunes like "Autumn Leaves," "What Is This Thing Called Love," "Tune-Up," "Pent Up House," "Lady Bird," and "Firm Roots," to name just a few. In major the progression is Dmin9–G9(13)–CΔ9. In minor it is Dmin7(♭5)–G7alt–Cm$^{6}_{9}$.

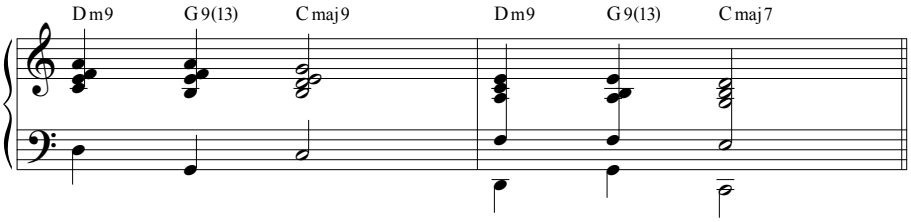


Figure 31.8.1 The II–V–I Progression in Major

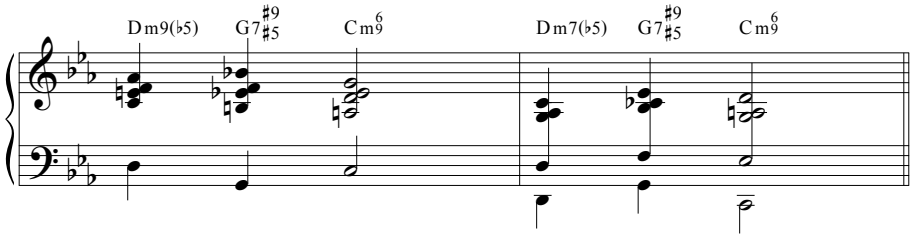


Figure 31.8.2 The II–V–I Progression in Minor

31.8.2 III–VI–II–V

The iii–vi–ii–V progression is called a **turnaround** because it replaces the static harmony of the I chord in the last two measures of a tune with harmonic motion that leads to the I chord that will occur upon repetition to the top of the form. This also applies to the I–VI–II–V progression.

One can modify a iii–vi–ii–V turnaround so all four chords are dominant seventh chords: III^7–VI^7–II^7–V^7 (or V^7/vi–V^7/ii–V^7/V–V^7—E^7–A^7–D^7–G^7 in lead sheet symbols). Turnarounds made solely of dominant seventh chords can them employ tritone substitutions (substituting a dominant seventh chord a tritone away because they have the same guide tones). For example, E^7–A^7–D^7–G^7 becomes E^7–$E\flat^7$–D^7–$D\flat^7$.

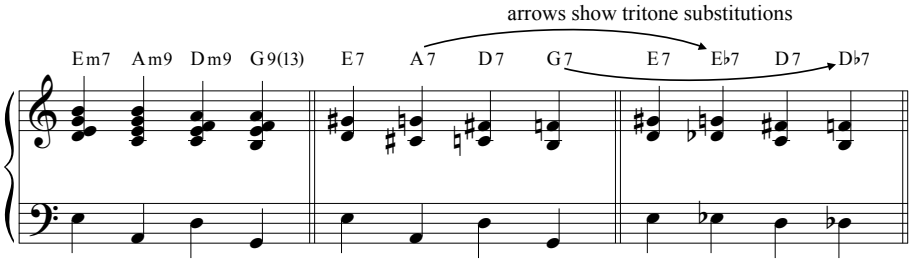


Figure 31.8.3 The III–VI–II–V Progression in Major and shown with Tritone Substitutions

Because of tritone substitutions, the $\flat\mathrm{II}^7$ chord can be substituted for V^7. In C, D♭9(13) is often substituted for $\mathrm{G}^7\left(\begin{smallmatrix}\sharp 9\\ \sharp 5\end{smallmatrix}\right)$.

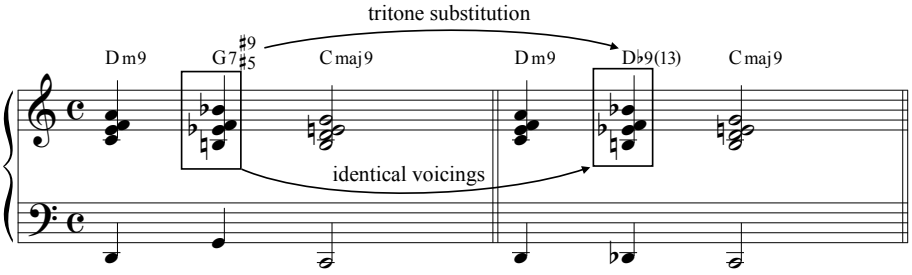


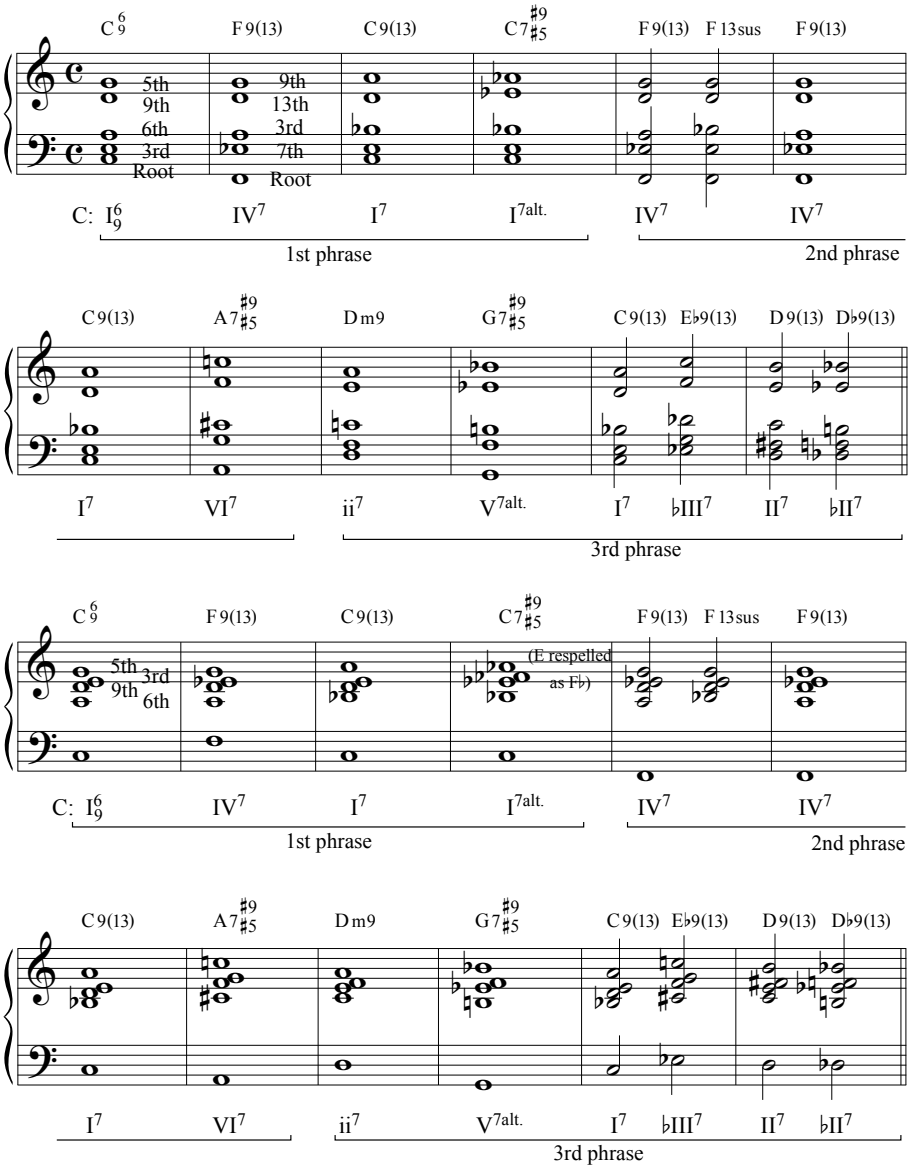
Figure 31.8.4 The $\flat\mathrm{II}^7$ substituting for V^7 in a Tritone Substitution

31.8.3 The Blues Progression

Below are two choruses of a common jazz version of the blues progression. The first chorus uses the first category of voicings ("spread" voicings) while the

second chorus uses the second category ("close" voicings with the 3rd or 7th as the lowest note).

Notice that the voicings for the $A^7\left(\begin{smallmatrix}\sharp 9\\ \sharp 5\end{smallmatrix}\right)$ and $E^{\flat 9}(13)$ are identical (not counting the roots) because the $E^{\flat 9}(13)$ is a tritone substitution for the $A^7\left(\begin{smallmatrix}\sharp 9\\ \sharp 5\end{smallmatrix}\right)$. The same is true for the $G^7\left(\begin{smallmatrix}\sharp 9\\ \sharp 5\end{smallmatrix}\right)$ and the $D^{\flat 9}(13)$. The Roman numerals below the staves are simplified.



Notice that the voice leading is very smooth for each part with the exception of the bass line. All voices move by step or by 3rd.

31.9 Scales

In this section on scales, our primary concern will be understanding how scales relate to corresponding chords in order to allow one to improvise a jazz solo. Similarly, understanding chord-scale relationships can allow one to write chordal

solos (like a sax soli or shout chorus in a jazz ensemble piece) where non-chord tones come from the corresponding scale.

31.9.1 The Blues Scale

The **blues scale** is identical to the minor pentatonic scale (1̂–♭3̂–4̂–5̂–♭7̂) except with an added ♭5̂/♯4̂ (1̂–♭3̂–4̂–♭5̂–5̂–♭7̂).

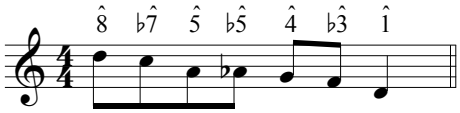


Figure 31.9.1 The Blues Scale (Descending)

A well-known example of the blues scale occurs in "Sunshine of Your Love" by Cream.

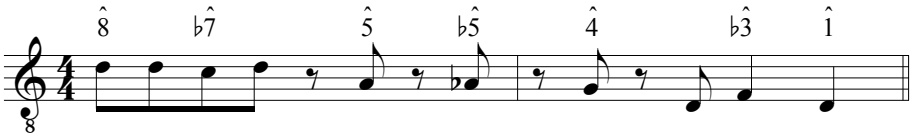


Figure 31.9.2 Jack Bruce and Eric Clapton, "Sunshine of Your Love"

In the blues scale, the ♭5̂ and ♭3̂ are considered to be "blue notes" because they are not chord tones (of a major triad or dominant 7th chord). Blue notes are commonly used in jazz and popular music.

In terms of using the blues scale as a soloist, you will find that some players use the blues scale over any and every chord, and that listeners' ears often find this acceptable.

31.9.2 The Bebop Scale

The bebop scale (known more specifically as the "**bebop dominant**" scale in jazz theory texts) is identical to the Mixolydian scale except is has an added ↑7̂. The added chromatic note (↑7̂) occurs in descending passages (from 8̂–7̂–♭7̂) as a chromatic passing tone. The bebop scale is most often used over the dominant 7th chord. In the most rudimentary form of improvising, one can use the bebop scale in descending eighth notes beginning on the downbeat of a measure, starting on the root, 3rd, 5th, or 7th.

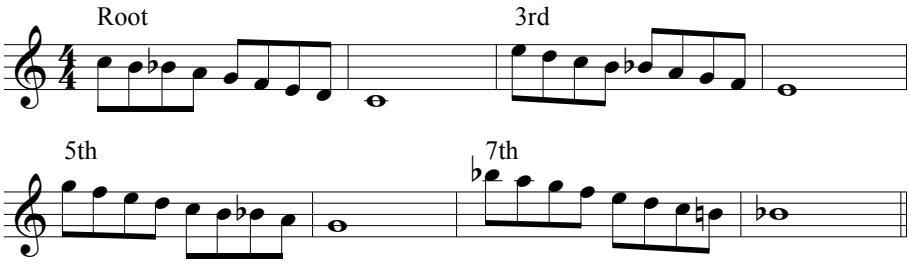


Figure 31.9.3 Descending C Bebop Scale starting on Root, then 3rd, then 5th, then 7th

31.9.3 Table of Scales

The scales below are represented by scale degrees. Synthetic scales like whole tone, diminished, and diminished-whole tone have many acceptable enharmonic respellings.

Table 31.9.4 Table of Scales

CLASSICAL SCALES	MODES AND HYBRID MODES	JAZZ AND SYNTHETIC
Major (“**Ionian**”) 1̂–2̂–3̂–4̂–5̂–6̂–7̂	**Mixolydian** 1̂–2̂–3̂–4̂–5̂–6̂–♭7̂	Blues 1̂–♭3̂–4̂–♭5̂–5̂–♭7̂
Natural Minor (“**Aeolian**”) 1̂–2̂–♭3̂–4̂–5̂–♭6̂–♭7̂	**Lydian** 1̂–2̂–3̂–♯4̂–5̂–6̂–7̂	Bebop Dominant 1̂–2̂–3̂–4̂–5̂–6̂–♭7̂–7̂
Harmonic Minor 1̂–2̂–♭3̂–4̂–5̂–♭6̂–7̂	**Dorian** 1̂–2̂–♭3̂–4̂–5̂–6̂–♭7̂	**Bebop Major** 1̂–2̂–3̂–4̂–5̂–♯5̂–6̂–7̂
Melodic Minor 1̂–2̂–♭3̂–4̂–5̂–6̂–7̂	**Phrygian** 1̂–♭2̂–♭3̂–4̂–5̂–♭6̂–♭7̂	**Whole Tone** 1̂–2̂–3̂–♯4̂–♯5̂–♭7̂
	Locrian 1̂–♭2̂–♭3̂–4̂–♭5̂–♭6̂–♭7̂	**Octatonic (Half-Whole)** (“**Diminished**” scale) 1̂–♭2̂–♭3̂–3̂–♯4̂–5̂–6̂–♭7̂
	Locrian ♯2 (6th mode Melodic Minor) 1̂–2̂–♭3̂–4̂–♭5̂–♭6̂–♭7̂	**Octatonic (Whole-Half)** (“Diminished” scale) 1̂–2̂–♭3̂–4̂–♯4̂–♯5̂–6̂–7̂
	Lydian-Dominant (4th mode Melodic Minor) 1̂–2̂–3̂–♯4̂–5̂–6̂–♭7̂	**Diminished-Whole Tone** (also “**Altered**” scale or 7th mode Melodic Minor) 1̂–♭2̂–♭3̂–♭4̂–♭5̂–♭6̂–♭7̂
	Phrygian-Dorian (2nd mode Melodic Minor) 1̂–♭2̂–♭3̂–4̂–5̂–6̂–♭7̂	**Hexatonic** 1̂–♭2̂–3̂–4̂–♯5̂–6̂
	Lydian-Augmented (3rd mode Melodic Minor) 1̂–2̂–3̂–♯4̂–♯5̂–6̂–7̂	
	Mixolydian-♭6̂ (5th mode Melodic Minor) 1̂–2̂–3̂–4̂–5̂–♭6̂–♭7̂	

31.10 How to Determine Chord-Scale Relationships

To discover a chord-scale relationship for almost any chord, write all of the notes of the chord (including upper extensions and altered notes), then fill in the thirds with the most logical choices, *avoiding augmented seconds and consecutive half steps.*

In the example below, we determine the scale that best fits $G\Delta^7(\sharp 11)$ by doing the following:

1. Identify the notes in the chord
2. Write all chord tones as a scale within the span of an octave
3. Fill in any gaps, avoiding augmented 2nds and consecutive half steps
4. Analyze the resulting scale

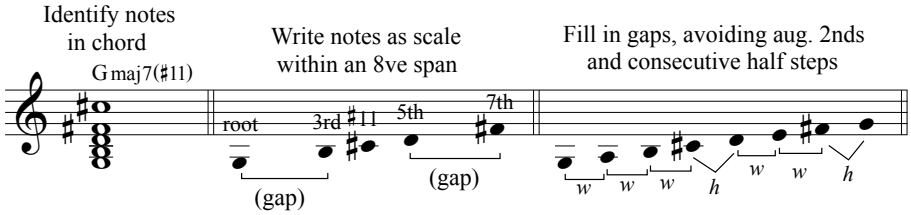


Figure 31.10.1 How to Determine a Scale for a Chord

The G Lydian scale is the most correct scale to play over $G\Delta^7(\sharp 11)$.

Principle 31.10.2 Determining Chord-Scale Relationships. *When constructing the scale, avoid augmented seconds and consecutive half steps*

31.10.1 List of Chord-Scale Relationships

Below is a list of common chord-scale relationships. When there are two scales listed for a single chord, it is because the chord has a minor third that can be filled with half step then whole step *or* whole step then half step. This knowledge of chord-scale relationships ultimately becomes second nature to an improvising jazz musician.

Table 31.10.3 List of Chord-Scale Relationships

CHORD	CORRESPONDING SCALE(S)
$C\Delta^7$	C major scale or C Lydian scale
$C\Delta^7$ (♯11)	C Lydian scale
$C\Delta^7$ (♯5)	C Lydian-Augmented scale
Cm^7	C dorian scale or C natural minor
$C^{ø7}$	C locrian scale or C locrian ♯2
$C^{ø9}$	C locrian ♯2
$C^{\circ 7}$	C Octatonic Whole-Half
$Cm\Delta^7$	C melodic minor ascending
$Cm\,{}^{6}_{9}$	C Dorian or C melodic minor ascending
C^7	C Mixolydian
C^7 (♯11)	C Lydian-Dominant
C^7 (♯5)	C Whole Tone scale
C^7 (♭5)	C Whole Tone scale
C^7 (♭9)	C Octatonic (Half-Whole)
C^7 (♯9)	C Octatonic (Half-Whole)
$C^{13}\left(\begin{smallmatrix}\sharp 11\\ \sharp 9\end{smallmatrix}\right)$	C Octatonic (Half-Whole)
C^7 alt	C Diminished-Whole Tone

This list is not exhaustive. Follow the process above ("How to Determine Chord-Scale Relationships") for chords not on this list.

Additionally, it is often important to look at the relationship of a chord to the overall key of a tune to determine the appropriate scale. For example, the $Fmin^7$ at the beginning of "All The Things You Are" by Jerome Kern is the vi^7 chord in A♭ major, in which case it would be inappropriate to play F Dorian because the D♮ would conflict with the D♭ in the key signature. One would play F natural minor (or Aeolian) instead.

31.11 Harmonizing the Bebop Scale

In *The Jazz Theory Book*, author Mark Levine provides a method for harmonizing the **bebop major** scale (1̂–2̂–3̂–4̂–5̂–♯5̂–6̂–7̂–8̂) with four voices.

Try singing through each part—soprano, alto, tenor, then bass.

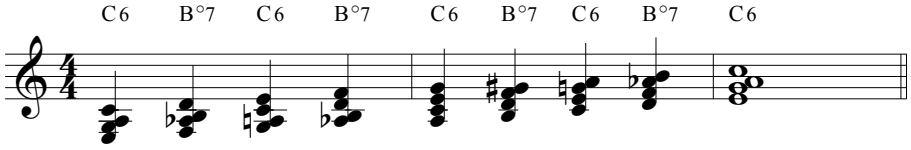


Figure 31.11.1 Four-Part Harmonization of the Bebop Scale in Major

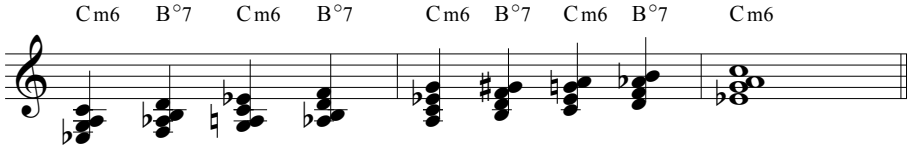


Figure 31.11.2 Four-Part Harmonization of the Bebop Scale in Minor

Notice that all of the non-tonic chords are $vii^{\circ 7}$ chords in various inversions.

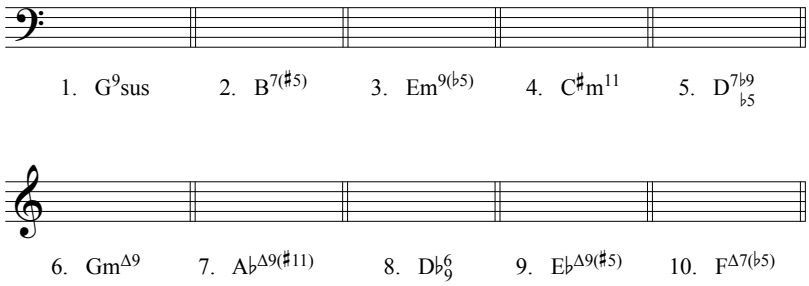
One hears a similar approach to harmonizing a scale (though without the fully-diminished seventh chords as passing chords) in the following example.

Figure 31.11.3 Count Basie and His Orchestra, "London Bridge is Falling Down"

31.12 Practice Exercises

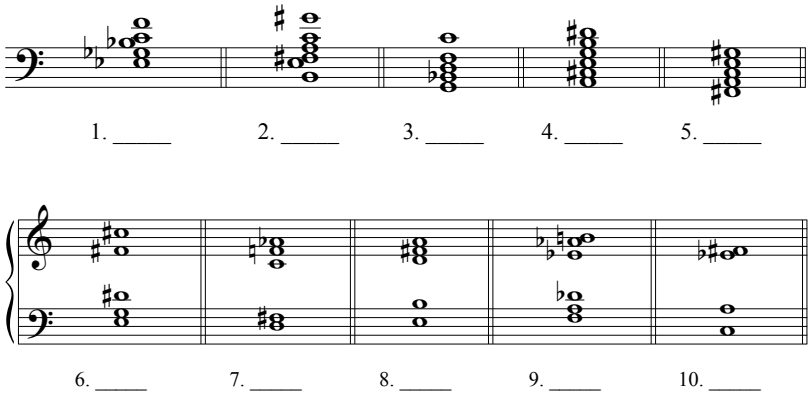
Exercise Group. Jazz Theory: Day One

1. Given the following lead-sheet symbols, write the chords. Remember it is sometimes appropriate to enharmonically respell notes like C♭, B♯, F♭, E♯ and altered notes like ♯5 and ♯9.



Exercise Group. Jazz Theory: Day Two

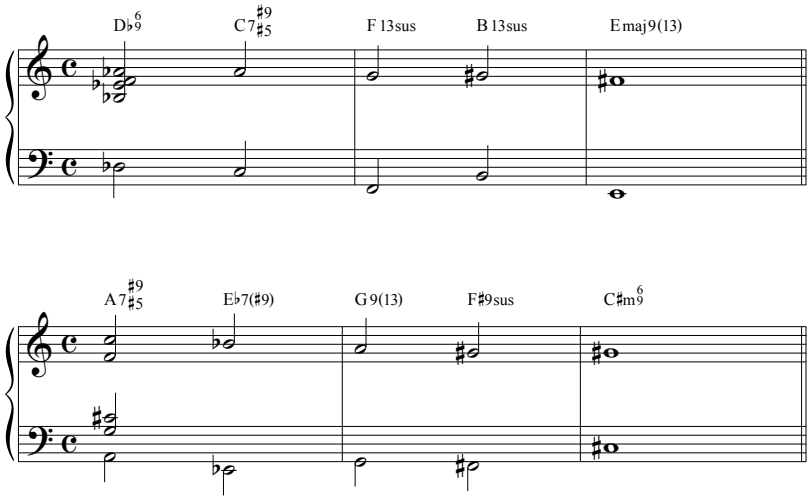
2. Label the following chords using jazz chords symbols.



Exercise Group. Jazz Theory: Day Three

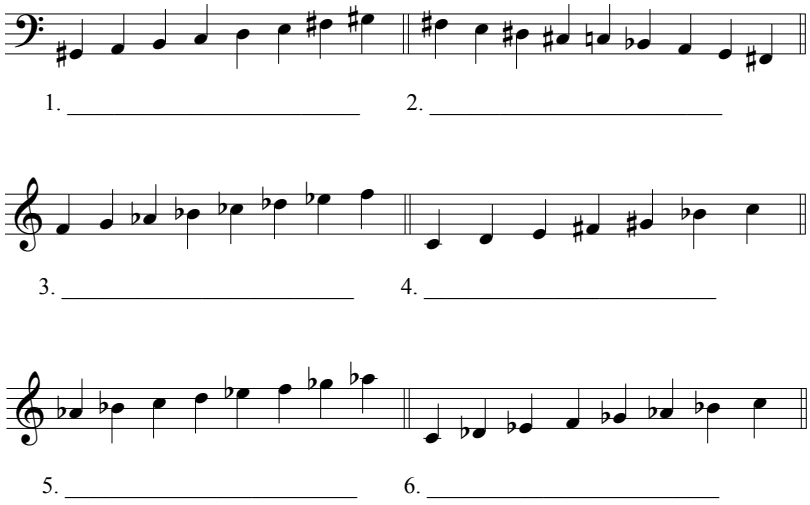
3. Voice lead the following progressions, maintaining five voices throughout. Remember to spell notes enharmonically when necessary. In the first example, use "close" voicing, keeping all the upper notes as close together as possible. In the second example, use Root–3rd–7th or

Root–7th–3rd always for the lowest three voices, then realize the rest of the lead sheet symbol with the upper two parts ("spread" voicing). Use Root–3rd–6th for 6th chords and Root–4th–7th for sus chords. You may need to omit the 5th to maintain five parts throughout.

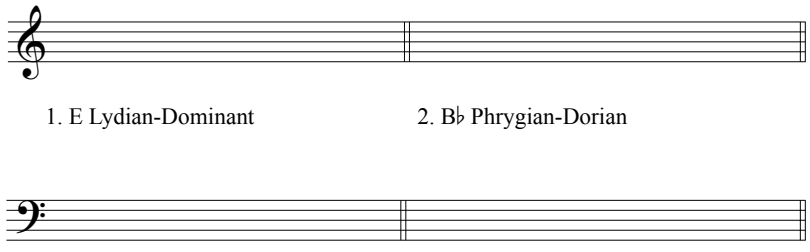


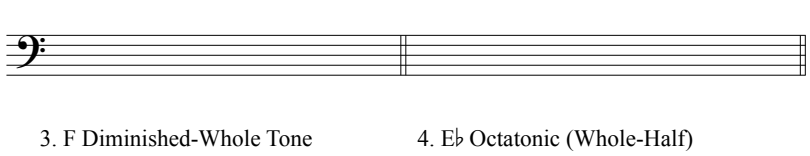
Exercise Group. Jazz Theory: Day Four

4. Please name the following scales.



5. Please write the following scales.

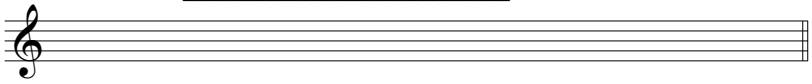




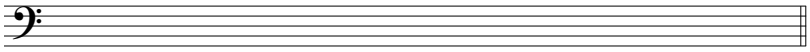
Exercise Group. Jazz Theory: Day Five

6. List the appropriate scale for the each chord by writing the chord tones then filling in the gaps. Avoid writing consecutive half steps and augmented seconds when constructing the scale.

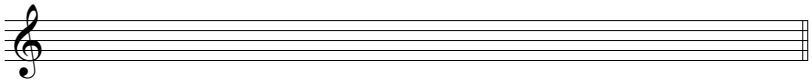
1. $E\flat^{7(\sharp5)}$; Scale: _____



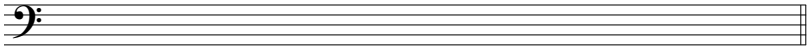
2. $B\flat^{7\substack{\sharp9\\\flat5}}$; Scale: _____



3. $Fm^{7(\flat5)}$; Scale: _____



4. $A\flat^{\Delta7(\sharp5)}$; Scale: _____



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Chapter 32

Impressionism and Extended Tonality

32.1 Impressionism

Impressionism is associated with Claude Debussy and Maurice Ravel in France, Ottorino Respighi in Italy, Charles Tomlinson Griffes in America, and Frederick Delius in England. We will focus on just three techniques found in the music of Debussy and Ravel: (1) the use of modes, (2) the use of upper extensions above the 7th in chord construction in tertian harmonies (9ths, 11ths, and 13ths, which we saw in the chapter on jazz), and (3) parallelism, also known as "planing."

1. *Use of modes.* Composers such as Debussy and Ravel sometimes wrote in the church modes (Phrygian, Lydian, etc.—see Scales) as an alternative to the heavily chromatic music of Richard Wagner (listen to the influential Prelude to Act I of Wagner's *Tristan und Isolde*).

    (a) The first movement of Debussy's String Quartet in G minor, Op. 10, begins in Phrygian mode. Notice that the seventh chord that occurs on the $\hat{5}$ scale degree is half-diminished in Phrygian. (The penultimate chord in this example is not in Phrygian mode.)

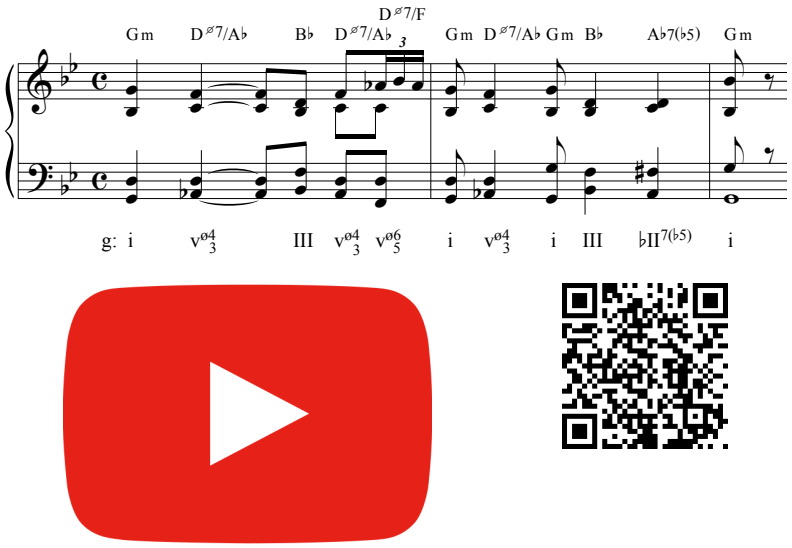


Figure 32.1.1 Debussy, String Quartet in G minor, Op. 10, I.

(b) The second movement ("Danse profane") of Debussy's *Danses* begins in Lydian mode.

Figure 32.1.2 Debussy, *Danses*, II. Danse profane

(c) The first movement of Ravel's *Piano Trio* Ravel begins in the Dorian mode. Notice that the penultimate chord is outside of the mode.

Figure 32.1.3 Ravel, *Piano Trio*, I.

(d) At the end of the first movement of Ravel's *Piano Trio*, Ravel transforms the theme by placing it in the Lydian mode. In this example, the final two chords are outside of the Lydian mode.

Figure 32.1.4 Ravel, *Piano Trio*, I.

2. *Use of upper extensions in chords.* Debussy and Ravel used chords containing ninths, elevenths, and thirteenths, sometimes with chromatic alterations to those upper extensions.

   (a) In bar 15 of Debussy's "Clair de lune" from his *Suite bergamasque*, Debussy uses an $E^{\flat}m^{9}$ chord with the 9th of the chord in the melody.

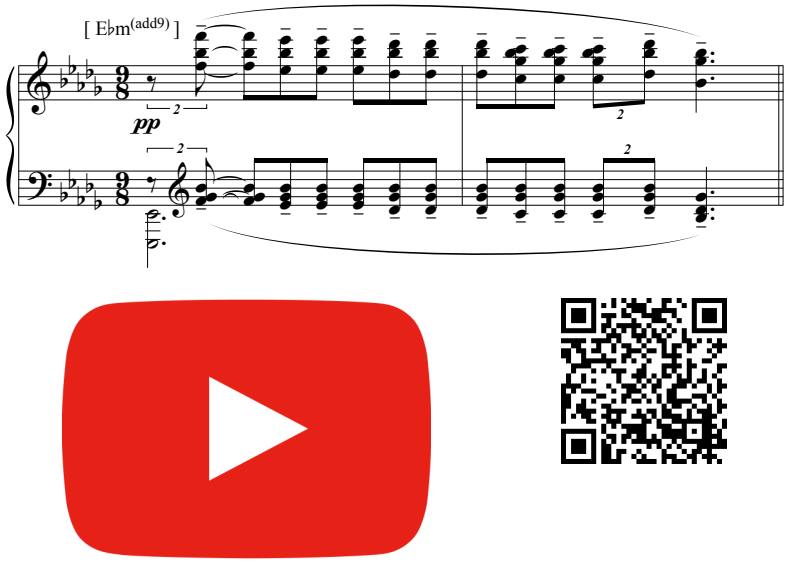


Figure 32.1.5 Debussy, *Suite bergamasque*, III. Clair de lune

(b) Bar 8 of Debussy's "La Puerta del Vino" from Book II of his *Preludes*, contains a $D^{\flat 7}$ in the left hand with the notes in the right hand alternating between the ♯9 and the ♭9.

Figure 32.1.6 Debussy, *Préludes*, Book II, No. 3, La Puerto del Vino

(c) In bar 70 of the same piece, Debussy also includes the ♯11 in the right hand, in addition to the ♯9 and ♭9.

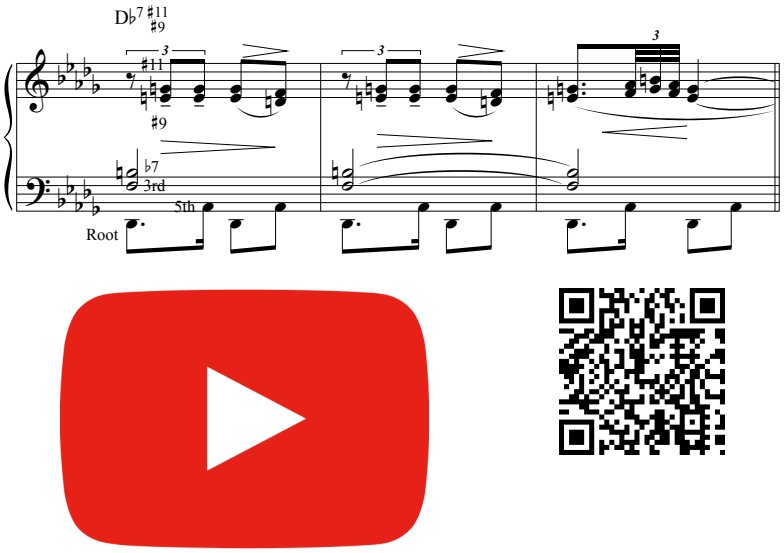


Figure 32.1.7 Debussy, *Préludes*, Book II, No. 3, La Puerto del Vino

3. *Use of parallelism* (also known as "planing"). In contrast to the prohibition against parallel fifths and octaves in traditional voice leading, both Debussy and Ravel would take a chord voicing and move all voices in parallel motion.

   (a) In *Pavane pour une infante défunte*, Ravel writes dominant 9th chords in parallel motion in bar 27.

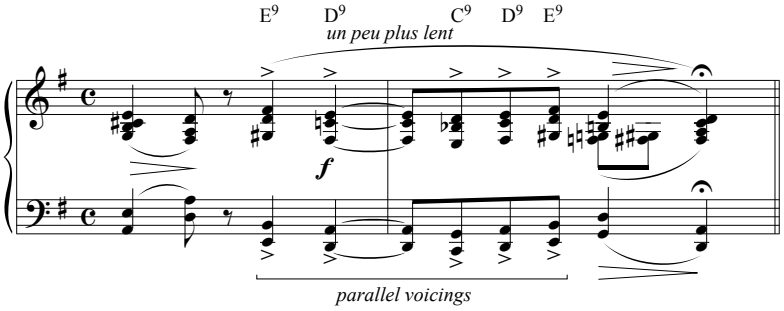


Figure 32.1.8 Ravel, *Pavane pour une infante défunte*

   (b) At 5 bars after rehearsal number 5 in *Prelude to the Afternoon of a Faun*, Debussy writes chromatically ascending dominant seventh chords.

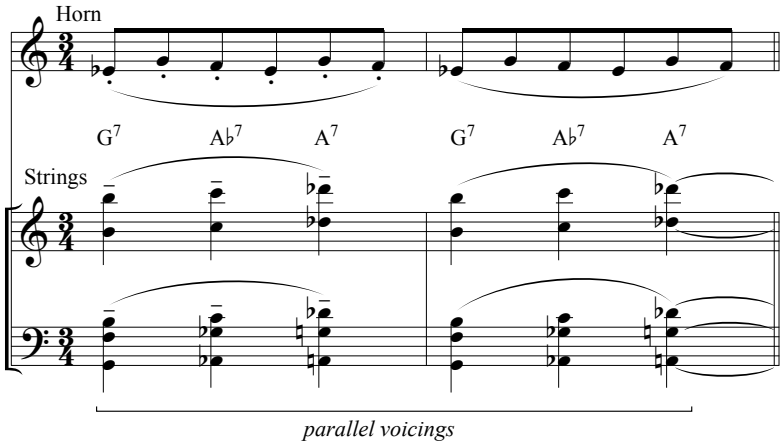


Figure 32.1.9 Debussy, *Prelude to the Afternoon of a Faun*

(c) At 4 bars after rehearsal number 2 in the same piece, Debussy moves seventh chords in parallel motion. Notice that the chords are not all of the same quality.

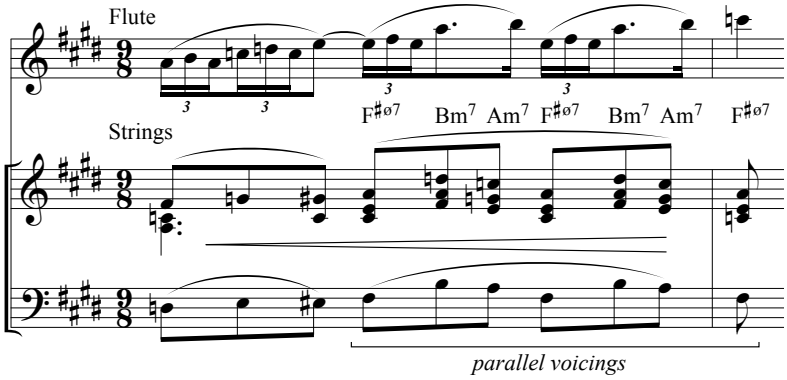


Figure 32.1.10 Debussy, *Prelude to the Afternoon of a Faun*

32.2 Pandiatonicism

Pandiatonicism refers to the use of all diatonic notes without the need for scale degrees or harmonies to progress or function tonally (V doesn't need to progress to I, $\hat{7}$ doesn't need to resolve to $\hat{8}$, etc.). One often hears it as a wash of notes from the major scale, or as chords made of non-traditional combinations of notes from a major scale, often with at least one interval of a 2nd in a chord voicing.

In the first example, notice how Stravinsky creates a wash of sound from the notes of the major scale.

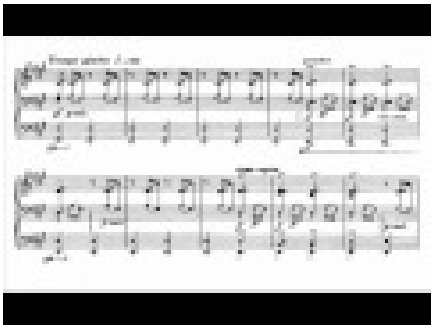
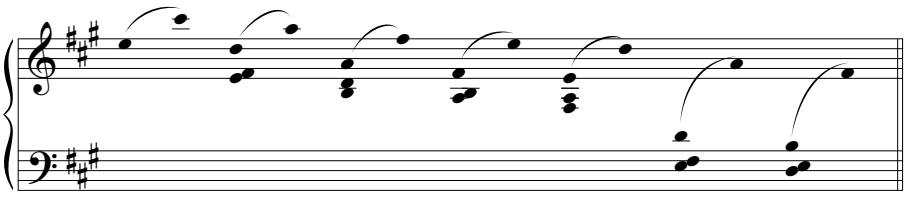


Figure 32.2.1 Stravinsky, *Petrushka*, Fourth Tableau: *The Shrovetide Fair (Toward Evening)*

In the second example, Copland uses non-traditional pandiatonic chord shapes in non-functional harmonic progression.



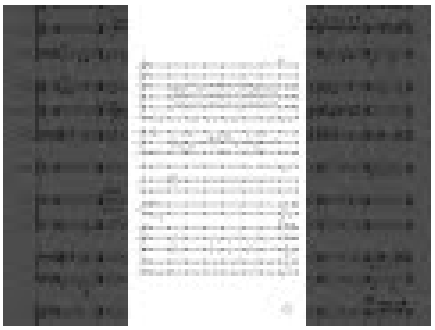


Figure 32.2.2 Copland, *Appalachian Spring*

The third example is similar to the first, with Copland creating a wash of sound from the notes of the major scale, with no regard to the dissonant intervals occurring in counterpoint.

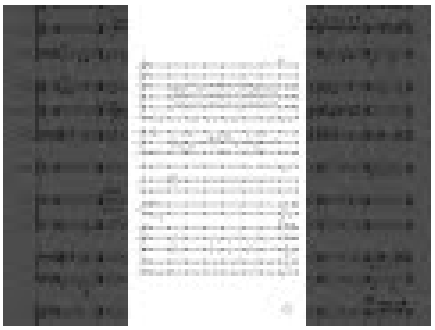


Figure 32.2.3 Copland, *Appalachian Spring*

32.3 Quartal, Quintal, and Secundal Harmony

Quartal harmony refers to chords stacked entirely (or mostly) in fourths. **Quintal harmony** refers to chords stacked entirely (or mostly) in fifths. **Secundal harmony** refers to chords stacked entirely (or mostly) in seconds. Contrast these concepts with the tertian (stacked in thirds) harmony we've encountered in the majority of this text. Alternative methods of stacking chords became more common after 1900 as composers sought ways to innovate and break with the past.

The next three examples demonstrate quartal harmony.

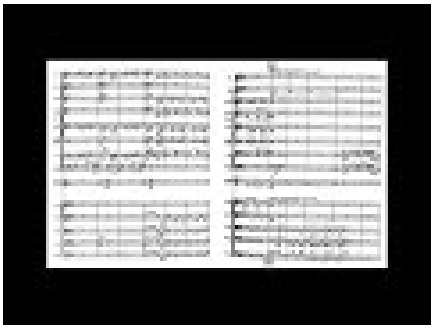


Figure 32.3.1 Schoenberg, Chamber Symphony No. 1, Op. 9

Figure 32.3.2 John Parker, *CHiPs* Theme

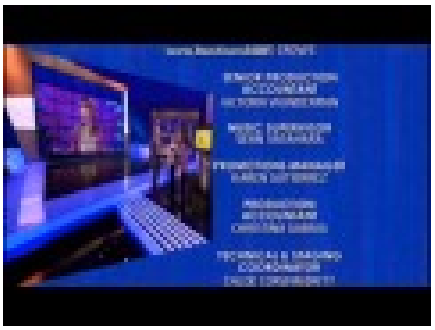


Figure 32.3.3 Merv Griffin and Julann Wright, *Jeopardy!* Theme

The following is an extended example of quintal harmony.

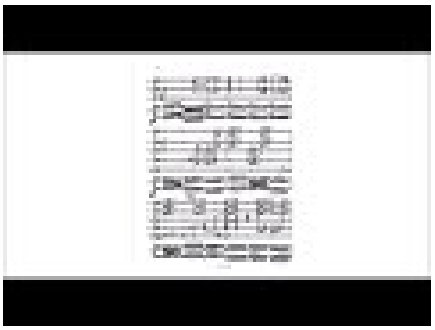


Figure 32.3.4 Bartók, Piano Concerto No. 2, II.

32.4 Polychords

A **polychord** typically consists of two triads sounding simultaneously. A polychord could also consist of two seventh chords, or a seventh chord and triad. Additionally, a polychord could conceivably consist of more than two triads or seventh chords, since the prefix "poly" means "many."

Perhaps the most famous polychord is the "Rite of Spring chord," an $E\flat^7$ chord sounding over an F♭ major chord, which occurs during the "Dance of the Adolescents."

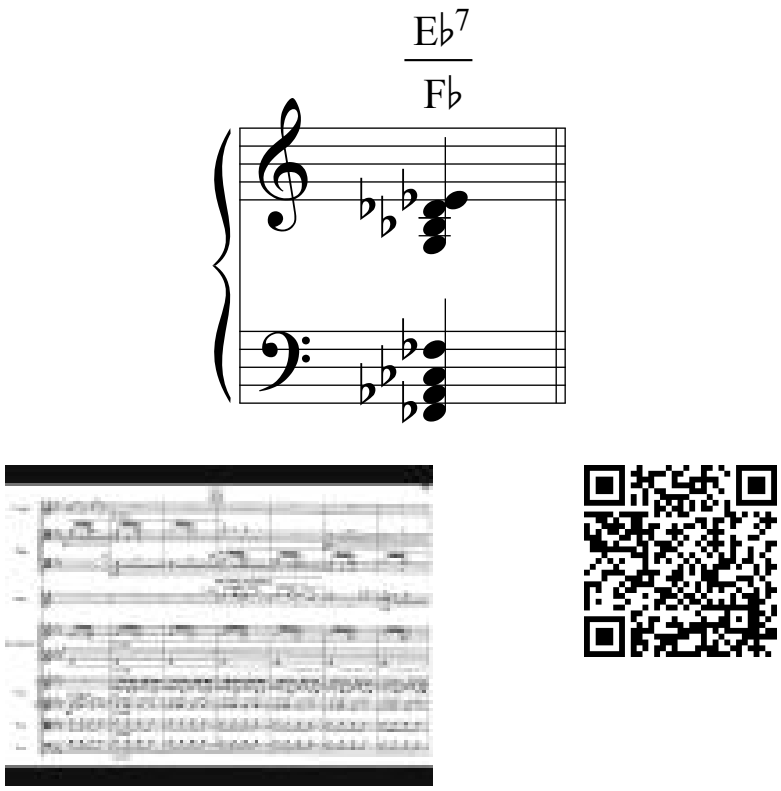
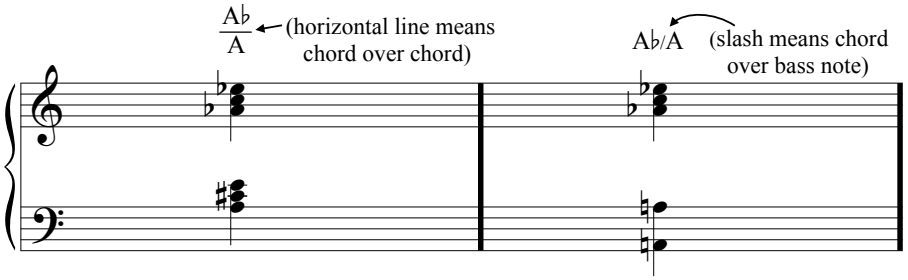


Figure 32.4.1 Stravinsky, *Rite of Spring*, "Dance of the Adolescents"

Polychords are notated using a horizontal line between the chords instead of a slash. (The slash was used for slash chords (see Subsection 6.3.1.)



Also note that it is not necessary to specify the inversion of each of the chords in the polychord.

In th example below, Copland voices an A major chord below an E major chord.

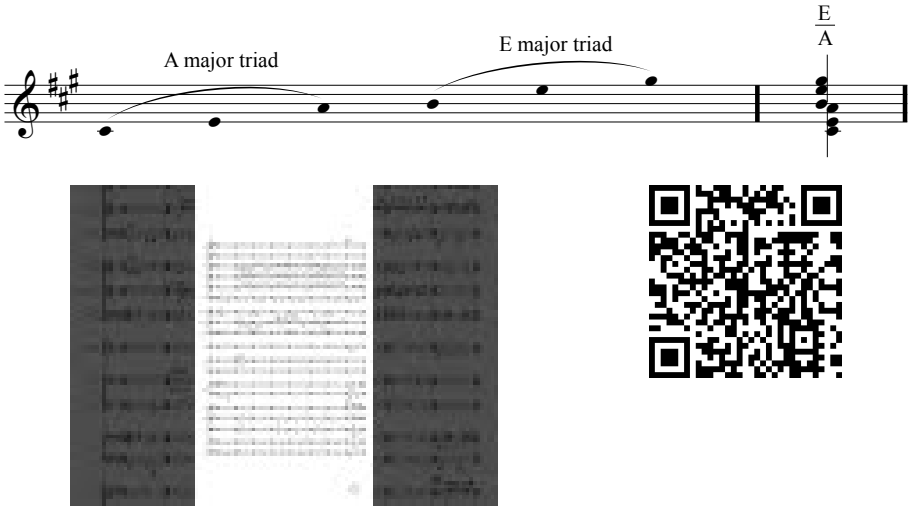


Figure 32.4.2 Copland, *Appalachian Spring*

In the example below, features chromatically ascending dominant seventh chords in the left hand against a repeating three-chord cycle of G–F–C in the right hand.

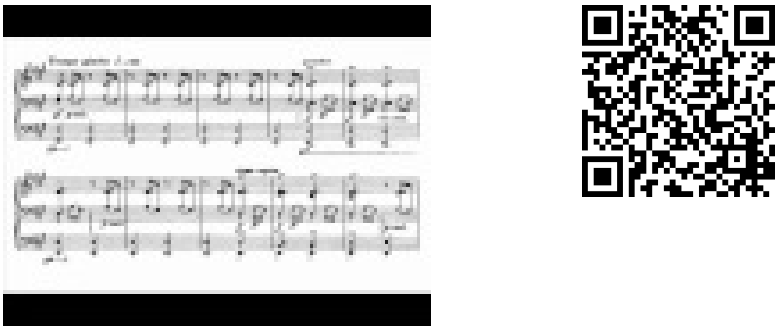
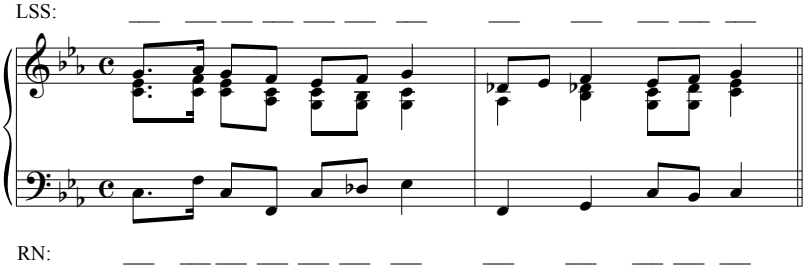


Figure 32.4.3 Stravinsky, *Petrushka*, Fourth Tableau: *The Shrovetide Fair (Toward Evening)*

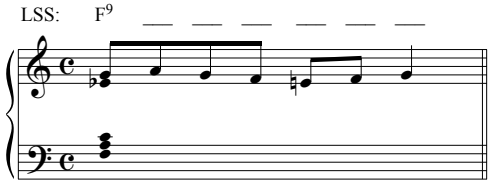
32.5 Practice Exercises

Exercise Group. Day One

1. *Use of modes.* Given the melody and chord symbols for "London Bridge" in Phrygian mode, analyze the chords as lead-sheet symbols ("LSS") and as Roman numerals ("RN").



2. *Use of parallelism.* Harmonize the opening of "London Bridge" so each note of the melody note is the 9th of a dominant ninth chord.



Exercise Group. Day Two

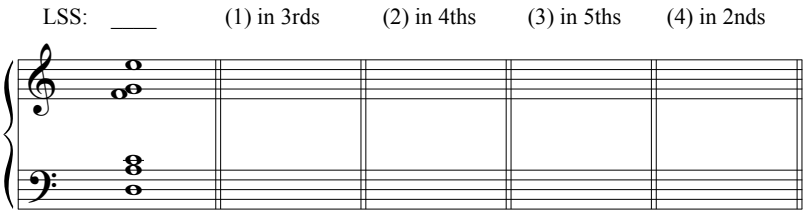
3. *Quartal, Quintal, and Secundal Harmony.* After analyzing the given chord as a lead-sheet symbol, revoice it in four ways:

(a) as a six-note tertian chord stacked only in thirds

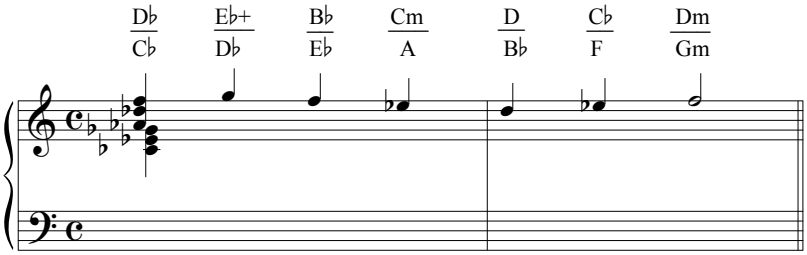
(b) as a six-note quartal chord stacked only in perfect 4ths

(c) as a six-note quintal chord stacked only in perfect 5ths

(d) as a six-note secundal chord stacked only in 2nds



4. *Polychords.* Harmonize "London Bridge" using the specified polychords. Remember that the chords can be in any inversion, but should should be playable (i.e., without too big of a stretch for the hands of the pianist).



Click here to download the first homework assignment for this chapter.
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Chapter 33

Set Theory

33.1 Set Theory

Set theory is the analytical technique we will use to analyze expressionist music. The primary composers associated with expressionism are Arnold Schoenberg (1874–1951), Anton Webern (1883–1945), and Alban Berg (1885–1935). In this text, we will associate **atonal music**—music that avoids traditional harmonies and scales—with expressionism. Instead of scales and chords, intervals are the building blocks of Expressionist music. Although composers began writing atonal music in 1908, there was no widely-accepted systematic analytical approach that could show relationships between different pieces until Allen Forte published his seminal *The Structure of Atonal Music* in 1973, in which Forte applied set theory mathematics to music. However, our approach to normal form and prime form will follow the slightly-modified approach set out by John Rahn in his *Basic Atonal Theory* (1980), which is the approach followed by Joseph Straus in his well-known and widely-used *Introduction to Post-Tonal Theory*.[1]

33.1.1 Atonal Music

Listen to the following example by Anton Webern.

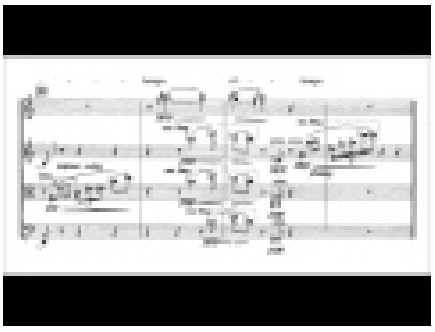
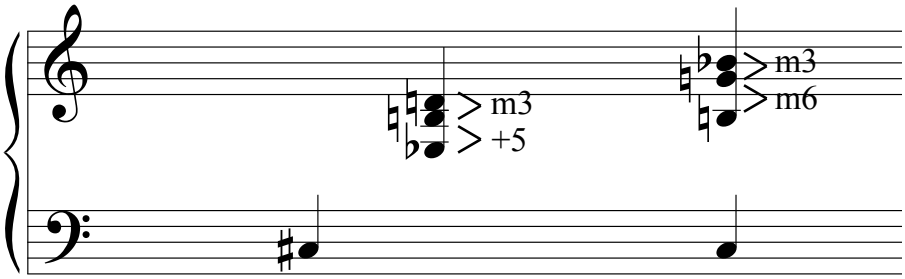


Figure 33.1.1 Webern, 5 movements for string quartet, No. 3. *Sehr bewegt*

Gone are the triadic structures we have studied throughout this text. In this music, intervals are paramount. Let us examine the intervals we find.

[1] Of the 208 sets that exist, only 6 are different between the Forte and Rahn methods for prime form. See https://www.mta.ca/pc-set/pc-set_new/pages/pc-table/packed.html.



Look at the intervallic structure of the first two chords,[2] not including the C♯ in the cello part. We see the interval of an augmented 5th below the interval of a minor 3rd in the first chord, and the interval of a minor sixth below the interval of a minor 3rd in the second chord. Notice that the names we use for intervals carry tonal implications. An augmented 5th would function differently than a minor 6th, but in atonal music, these intervals have the same sound, are separated by the same number of half steps, and have no tonal implications (they don't have to resolve any particular way). Therefore, analysts like Allen Forte used integers to represent pitches and intervals to remove the tonal implications of staff notation.

33.1.2 Integer Notation for Pitches

One notable trait of set theory is that we will represent pitches with integers, as seen in the table below.

Note name:	C	C♯/D♭	D	D♯/E♭	E	F	F♯/G♭	G	G♯/A♭	A	A♯/B♭	B
Integer:	0	1	2	3	4	5	6	7	8	9	10	11

It may be helpful to remember that the C major triad (C, E, and G) consists of integers 0, 4, and 7.

Integer notation of pitches means we assume **enharmonic equivalence** of notes. For example, D, C𝄪, and E𝄫 are all represented as pitch integer 2. We also assume **octave equivalence**, which itself presumes the notion of **pitch class**. When we say Beethoven's first symphony is in C, we refer not to any specific C (C_1, C_2, C_3, etc.), but to the concept of the pitch class C, which includes any and all Cs. Therefore, you would label the note C as pitch class 0, no matter the register in which it occurs.

33.1.3 Integer Notation for Intervals

We will also measure intervals using integers, with each interval represented by the number of **semitones** (half steps) it contains. The following table contains the number of semitones in each interval.

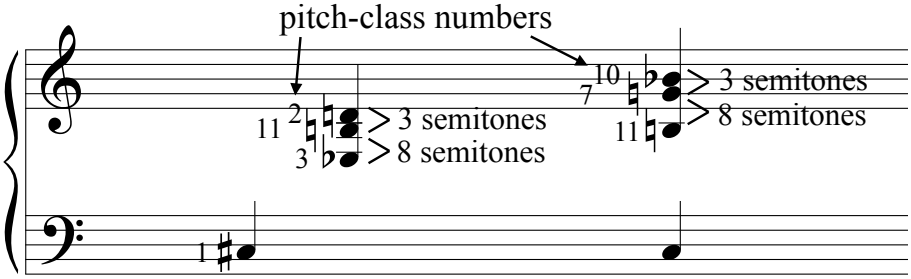
[2] Some authors call atonal chords "sonorities" to differentiate them from chords in the traditional triadic sense; we will continue to use "chord" in this text.

Table 33.1.2 Interval Integers

Interval	Number of Semitones	Interval	Number of Semitones
m2	1	P5	7
M2	2	m6	8
m3	3	M6	9
M3	4	m7	10
P4	5	M7	11
TT	6	P8	12

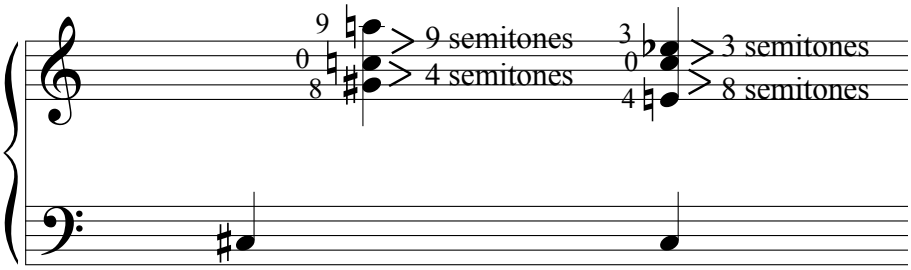
33.1.4 Pitch-Class Sets

In atonal music we will analyze sets of pitch classes, hence the term "pitch-class set analysis." Let us return to the example by Webern, this time with integers for pitches and for intervals.



The first chord consists of E♭, B, and D, or pitch integers 3, 11, and 2. If we examine the intervallic distance, we find 8 semitones between pitch integers 3 and 11, and 3 semitones between 11 and 2. Note that we are working in a modulo 12 system, meaning we restart our numbering after 11 (0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 0, 1, 2, 3, etc.). We are used to modulo 12 thinking since we all deal with clocks. If a meeting ran from 11am to 2pm, it lasted 3 hours. Therefore, an interval from pitch integer 11 to pitch integer 2 spans 3 semitones. The second chord has the same intervallic construction.

Now, let's look at the two chords in the second half of the third measure.



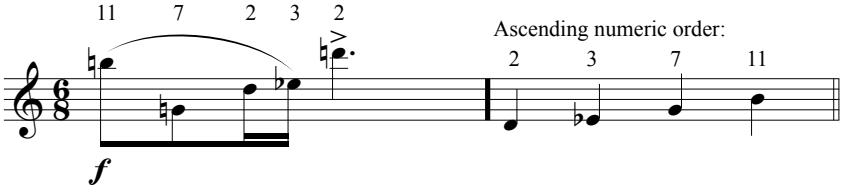
We see right away that the second of these chords has the same construction as the two chords we examined the in earlier examples (a minor 6th below a minor 3rd). However, the first chord in this example (G♯, C, A, or 8, 0, 9) appears to be different, with a diminished 4th from G♯ to C (an interval spanning 4 semitones, enharmonically equivalent to a major 3rd) below the interval of a major 6th from C to A (spanning 9 semitones). To see the relationship of this chord to the others, we need to learn about normal form and prime form.

33.2 Normal Form

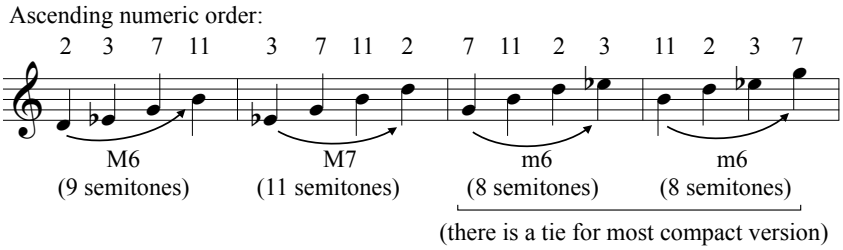
Normal form represents the notes of a pitch-class set (as they occur in the music) in their most compact form.

To determine normal form, follow these steps:

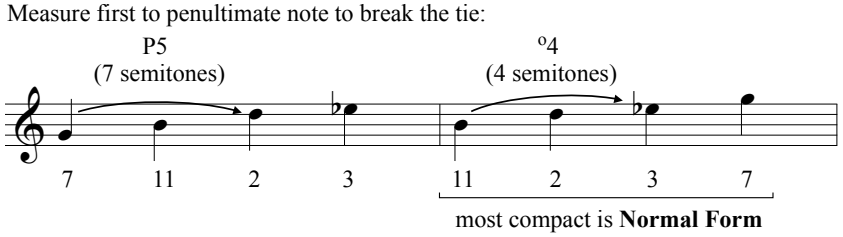
1. Put the notes of a pitch-class set from a piece of music in ascending numeric order (like a scale). Eliminate any duplicate pitches.



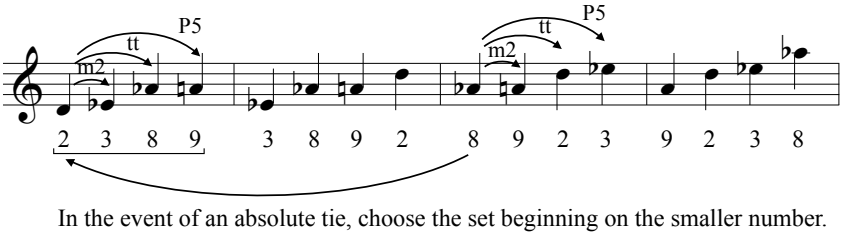
2. Examine every possible ascending "scale" ordering of the notes until you find the most compact form—that is, the one that spans the smallest interval from lowest to highest note.



3. In the event that two orderings have the same interval span from lowest to highest note, choose the set that has the smaller interval between the first and penultimate notes.[1]



4. In the event of an absolute tie, choose the set that begins on the smaller number. We will use a different set of pitches to demonstrate a complete tie. The normal form for the notes below is [2, 3, 8, 9].



[1] The Forte method for determining prime form would have measured from first to second note to break the tie instead of first to penultimate note, which is the method used in Rahn's *Basic Atonal Theory*.

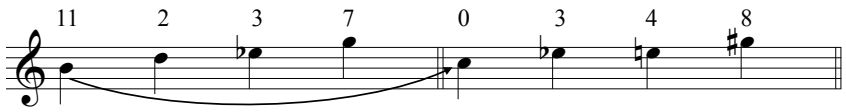
5. Normal form is written in square brackets with commas. The normal form found in step 3 above was [11, 2, 3, 7].

33.3 Prime Form

Whereas normal form deals with the exact pitches as they occur in the music, **prime form** is usually a transposition and possibly an inversion of the normal form to its most essential form, much in the way an E♭ major triad in second inversion belongs to the category "major triad," or a G^7/F belongs to the more general idea "dominant seventh chord." Perhaps because of the primacy of C in music theory—many ideas are demonstrated in their relation to the C major scale—all prime forms are transposed to and start on C (pitch integer 0).

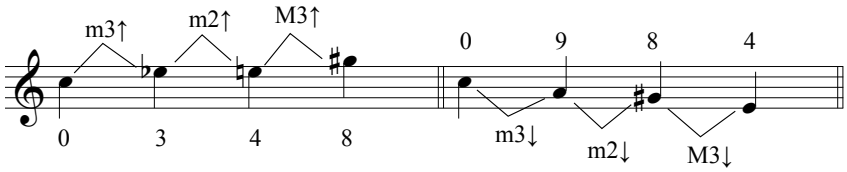
Following is the process for determining prime form.

1. Transpose the normal form—[11, 2, 3, 7] from the normal form example in the previous section—so it starts on C (pitch integer 0): 0, 3, 4, 8



Normal form transposed to start on 0

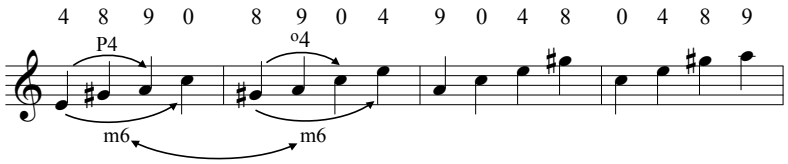
2. Invert the transposed normal form (what went up now goes down).



3. Write this inverted form in ascending form (4, 8, 9, 0), then do one of the following:

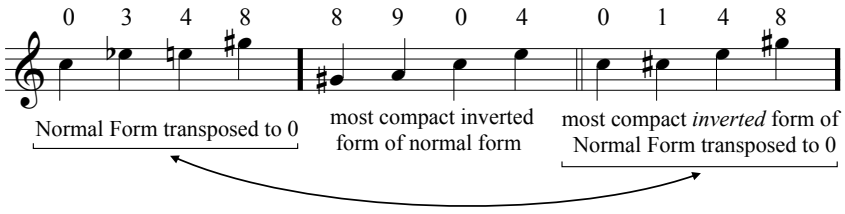
   (a) If there were no ties when determining normal form, proceed to the step 4.

   (b) If there were ties, put this inverted version through every ascending "scale" ordering to determine which is the most compact form from first note to penultimate note. In the example below, we see that the second ordering (the "tie loser" from normal form) is the most compact of the reorderings of the inverted normal form.



tie (break tie by measuring first to penultimate note)

4. Compare the normal form (transposed to 0) to the most compact inverted form (transposed to 0). The most compact form is the prime form. Prime form is written in parentheses with no commas: (0148).

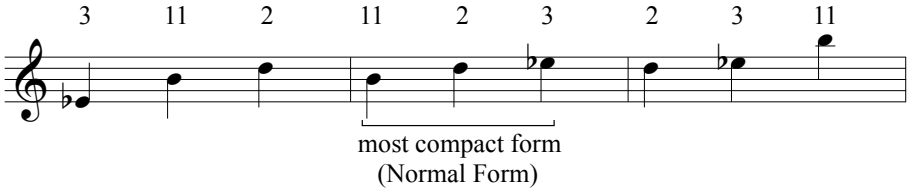


(a) In the event the prime form reaches pitch integers 10 or 11, use T for 10 and E for 11; for example (013568T)

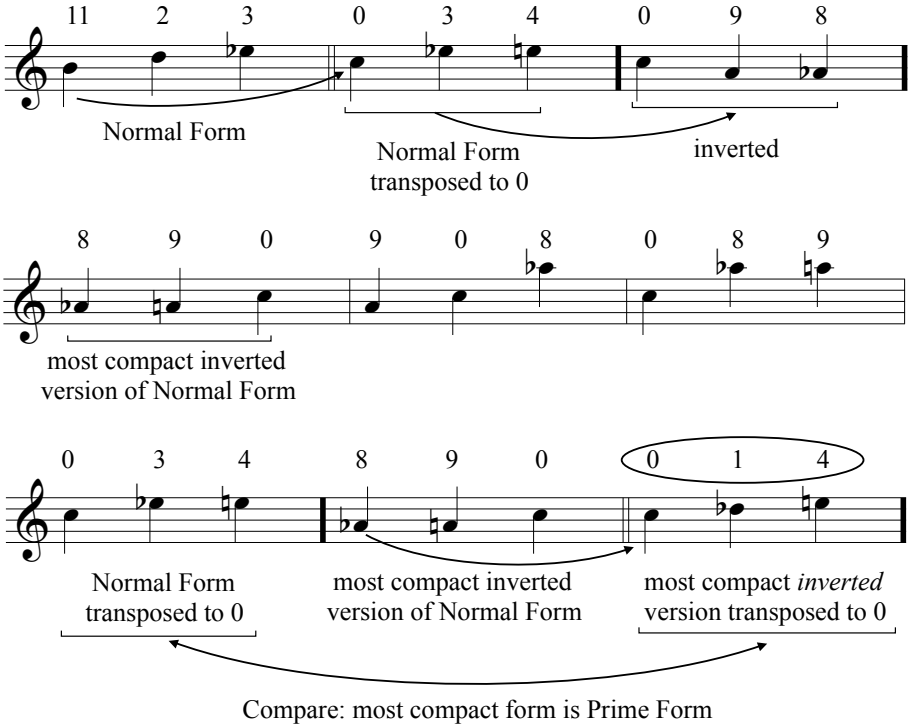
33.3.1 Application of Normal Form and Prime Form

Let's determine normal form and prime form of the first set from the Webern excerpt.

The first chord contained E♭, B, and D (3, 11, and 2).

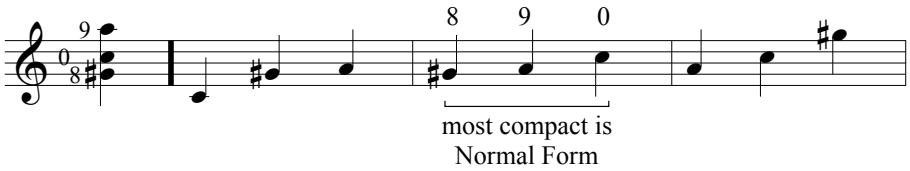


The normal form is [11, 2, 3]. Below is the calculation to determine prime form.



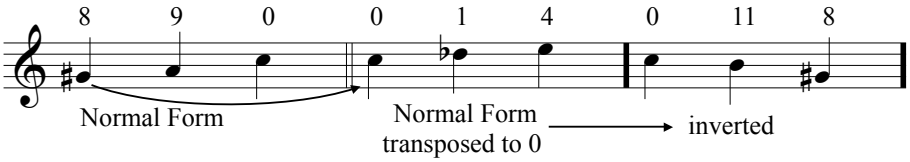
The prime form is (014).

Now let's determine the normal form and prime form for the third set we encountered: G♯, C, and A, or 8, 0, and 9.

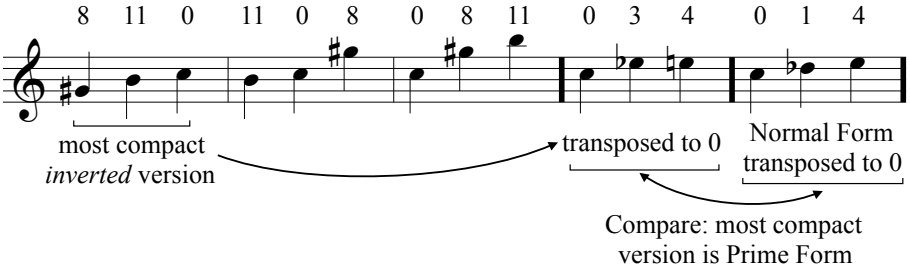


The normal form is [8, 9, 0].

In the example below, we transpose the normal form to zero, then invert it.



In the following example, we put the inverted normal form through the reorderings to find the most compact form, then compare it to the normal form.

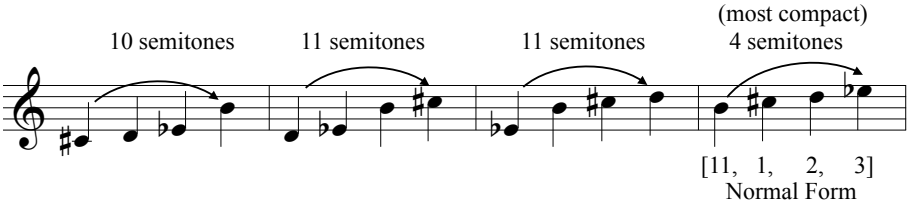


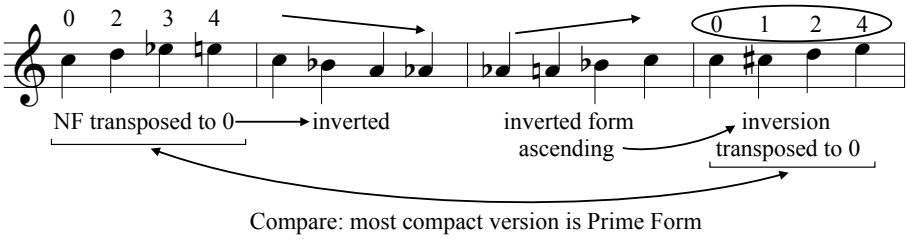
We see that the third set has the same prime form—(014)—as the other sets in the opening measures of Webern's Op 5, No. 3. Prime form can allow us to see relationships that may not be apparent on the surface of the music.

33.3.2 Segmentation

What about the C♯ in the cello part? Should it be included with the three notes from the chords? Will another similarity be revealed? **Segmentation** is the term for "segmenting" or determining which notes to group together and analyze in a passage. Usually, segmentation is based on the music—notes sounding together as a chord, or notes in a melodic line. However, analysts may look at every possible combination of notes to search for deeper layers of connection.

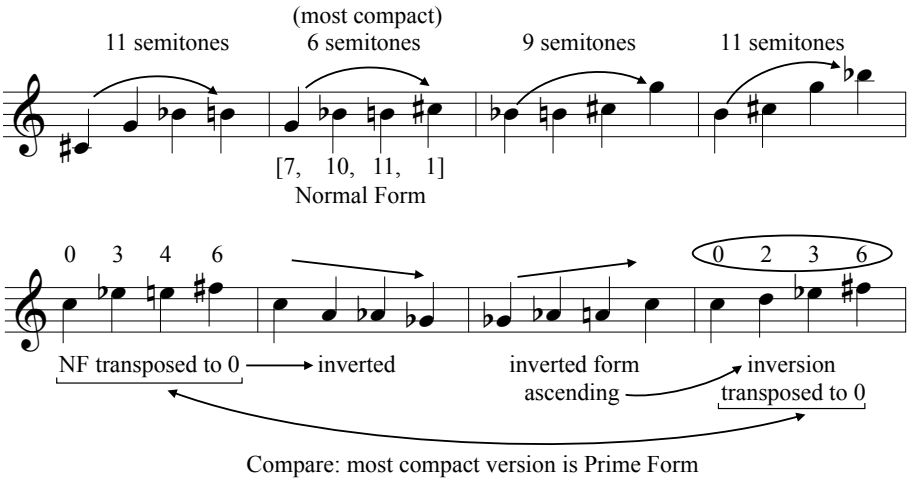
Below, we examine the first two chords with the C♯ included in each.





The prime form of the first set, when including the C♯ from the cello, is (0124).

Here is the second chord with the C♯ added to it.



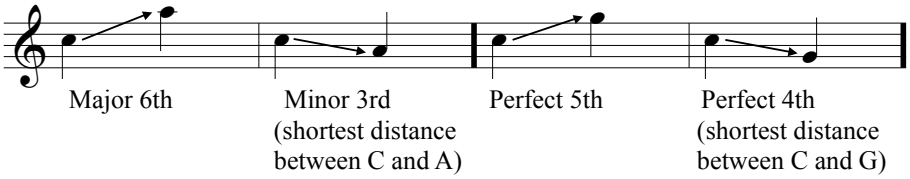
The prime form of the second set, when including the C♯ from the cello, is (0236).

We do not see any relationship between these first two sets after including the C♯ with each three-note set. One doesn't know this until one examines this new segmentation.

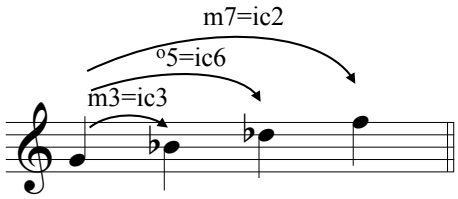
33.4 Interval Vector

An **interval vector** (also known as "Interval Class Content") is a list of every possible interval occurring in a pitch-class set. Calculating an interval vector is rather straightforward. First, after determing normal form, measure from the first note to all the other notes. Second, measure from the second note to all higher notes (not back or down to the first note). Continue measuring from each successive note to the notes following and you will have completed the interval vector.

Before demonstrating this, it is important to discuss the term "interval class." An **interval class** (abbreviated "ic") is the shortest distance between two notes measured in semitones. In the example below, C up to A is a major 6th. However, the shortest distance between C and A (measure downward) is a minor 3rd. Therefore, the largest interval class is 6 (the tritone), because any perfect 5th (for example, from C to G) has an interval class of 5 (a perfect 4th) because C *down* to G is a perfect 4th.

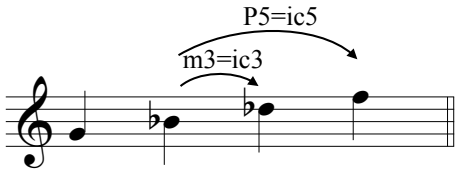


With this in mind, let's complete an interval vector of the a half-diminished 7th chord on G. First, arrange the notes in ascending order, then measure from the first note to the second, third, and fourth notes.



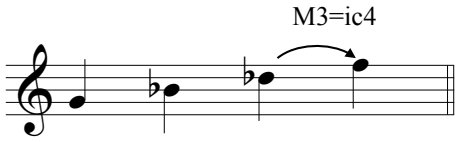
Interval Class:	1	2	3	4	5	6
Occurrences	0	1	1	0	0	1

Second, measure from the second note to the third and fourth notes. We add one tally each for interval class (ic) 3 and 5.



Interval Class:	1	2	3	4	5	6
Occurrences	0	1	2	0	1	1

Finally, measure from the third note to the fourth note, and the interval vector will be complete. We add one tally for ic4; the complete interval vector is 012011, which tells us a half-diminished chord has zero half steps, one major 2nd (shown in this voicing as a minor 7th), two minor 3rds, no major 3rds, one perfect 4th (shown in this voicing as perfect 5th), and one tritone.



Interval Class:	1	2	3	4	5	6
Occurrences	0	1	2	1	1	1

An interval vector always contains 6 digits. When an interval class does not occur (the way the minor second did not occur in the G half-diminished seventh chord), place a zero in the column for that interval class.

33.5 Forte Numbers

When Allen Forte created a catalog of every possible 3-, 4-, 5-, 6-, 7-, 8-, and 9-note set in Appendix 1 of *The Structure of Atonal Music*, he labeled each prime form with two numbers separated by a hyphen. His labels (3–1, 3–2, etc.) are now known as "**Forte numbers**," and are seen in the tables in the Lists of Set Classes, which include prime forms and interval vectors as well.

33.5.1 Z-Relations

"Z" in a set label (for example, 4–Z29) stands for "zygotic" ("twinned"), and is used when different prime forms have the same interval vector (for example, the interval vector for both 4–Z29 and 4–Z15 is 111111).

33.6 Lists of Set Classes

Below are lists of all set classes with prime form, Forte number, and interval vectors shown. Allen Forte published the original list of set classes in *The Structure of Atonal Music* in 1973. These lists use prime forms as calculated using the Rahn method. Prime forms of sets are ordered from most packed to the left to least packed to the left, as is found in the list of set classes in both John Rahn's *Basic Atonal Theory* and Joseph Straus' *Introduction to Post-Tonal Theory*. Sets are listed across from their **complements**. When taken together, complements can complete the 12-note chromatic scale when correctly transposed (and sometimes inverted).

Table 33.6.1 List of Set Classes for 3- and 9-note sets (Trichords and Nonachords)

Prime Form	Forte Number	Interval Vector	Prime Form	Forte Number	Interval Vector
(012)	3–1	210000	(012345678)	9–1	876663
(013)	3–2	111000	(012345679)	9–2	777663
(014)	3–3	101100	(012345689)	9–3	767763
(015)	3–4	100110	(012345789)	9–4	766773
(016)	3–5	100011	(012346789)	9–5	766674
(024)	3–6	020100	(01234568T)	9–6	686763
(025)	3–7	011010	(01234578T)	9–7	677673
(026)	3–8	010101	(01234678T)	9–8	676764
(027)	3–9	010020	(01235678T)	9–9	676683
(036)	3–10	002001	(01234679T)	9–10	668664
(037)	3–11	001110	(01235679T)	9–11	667773
(048)	3–12	000300	(01245689T)	9–12	666963

Table 33.6.2 List of Set Classes for 4– and 8–note sets (Tetrachords and Octachords)

Prime Form	Forte Number	Interval Vector	Prime Form	Forte Number	Interval Vector
(0123)	4–1	321000	(01234567)	8–1	765442
(0124)	4–2	221100	(01234568)	8–2	665542
(0125)	4–4	211110	(01234578)	8–4	655552
(0126)	4–5	210111	(01234678)	8–5	654553
(0127)	4–6	210021	(01235678)	8–6	654463
(0134)	4–3	212100	(01234569)	8–3	656542
(0135)	4–11	121110	(01234579)	8–11	565552
(0136)	4–13	112011	(01234679)	8–13	556453
(0137)	4–Z29	111111	(01235679)	8–Z29	555553
(0145)	4–7	201210	(01234589)	8–7	645652
(0146)	4–Z15	111111	(01234689)	8–Z15	555553
(0147)	4–18	102111	(01235689)	8–18	546553
(0148)	4–19	101310	(01245689)	8–19	545752
(0156)	4–8	200121	(01234789)	8–8	644563
(0157)	4–16	110121	(01235789)	8–16	554563
(0158)	4–20	101220	(01245789)	8–20	545662
(0167)	4–9	200022	(01236789)	8–9	644464
(0235)	4–10	122010	(02345679)	8–10	566452
(0236)	4–12	112101	(01345679)	8–12	556543
(0237)	4–14	111120	(01245679)	8–14	555562
(0246)	4–21	030201	(0123468T)	8–21	474643
(0247)	4–22	021120	(0123568T)	8–22	465562
(0248)	4–24	020301	(0124568T)	8–24	464743
(0257)	4–23	021030	(0123578T)	8–23	465472
(0258)	4–27	012111	(0124578T)	8–27	456553
(0268)	4–25	020202	(0124678T)	8–25	464644
(0347)	4–17	102210	(01345689)	8–17	546652
(0358)	4–26	012120	(0134578T) [1]	8–26	456562
(0369)	4–28	004002	(0134679T)	8–28	448444

[1] Forte prime form for 8–26: (0124579T)

Table 33.6.3 List of Set Classes for 5– and 7–note sets (Pentachords and Septachords)

Prime Form	Forte Number	Interval Vector	Prime Form	Forte Number	Interval Vector
(01234)	5–1	432100	(0123456)	7–1	654321
(01235)	5–2	332110	(0123457)	7–2	554331
(01236)	5–4	322111	(0123467)	7–4	544332
(01237)	5–5	321121	(0123567)	7–5	543342
(01245)	5–3	322210	(0123458)	7–3	544431
(01246)	5–9	231211	(0123468)	7–9	453432
(01247)	5–Z36	222121	(0123568)	7–Z36	444342
(01248)	5–13	2221311	(0124568)	7–13	443532
(01256)	5–6	311221	(0123478)	7–6	533442
(01257)	5–14	221131	(0123578)	7–14	443352
(01258)	5–Z38	212221	(0124578)	7–Z38	434442
(01267)	5–7	310132	(0123678)	7–7	532353
(01268)	5–15	220222	(0124678)	7–15	442443
(01346)	5–10	223111	(0123469)	7–10	445332
(01347)	5–16	213211	(0123569)	7–16	435432
(01348)	5–Z17	212320	(0124569)	7–Z17	434541
(01356)	5–Z12	222121	(0123479)	7–Z12	444342
(01357)	5–24	131221	(0123579)	7–24	353442
(01358)	5–27	122230	(0124579)	7–27	344451
(01367)	5–19	212122	(0123679)	7–19	434343
(01368)	5–29	122131	(0124679)	7–29	344352
(01369)	5–31	114112	(0134679)	7–31	336333
(01457)	5–Z18	212221	(0145679) [2]	7–Z18	434442
(01458)	5–21	202420	(0124589)	7–21	424641
(01468)	5–30	121321	(0124689)	7–30	343542
(01469)	5–32	113221	(0134689)	7–32	335442
(01478)	5–22	202321	(0125689)	7–22	424542
(01568) [3]	5–20	211231	(0125679) [4]	7–20	433452
(02346)	5–8	232201	(0234568)	7–8	454422
(02347)	5–11	222220	(0134568)	7–11	444441
(02357)	5–23	132130	(0234579)	7–23	354351
(02358)	5–25	123121	(0234679)	7–25	345342
(02368)	5–28	122212	(0135679)	7–28	344433
(02458)	5–26	122311	(0134579)	7–26	344532
(02468)	5–33	040402	(012468T)	7–33	262623
(02469)	5–34	032221	(013468T)	7–34	254442
(02479)	5–35	032140	(013568T)	7–35	254361
(03458)	5–Z37	212320	(0134578)	7–Z37	434541

In the table below, when no set is listed across from a six–note set, it is self–complementary (that is, it can combine with a transposed and possibly inverted set of itself to complete a 12-note chromatic scale.

[2] Forte prime form for 7–Z18: (0123589)
[3] Forte prime form for 5–20: (01378)
[4] Forte prime form for 7–20: (0124789)

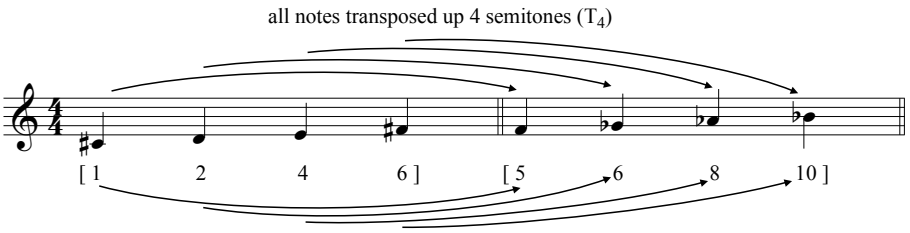
Table 33.6.4 List of Set Classes for 6-note sets (Hexachords)

Prime Form	Forte Number	Interval Vector	Prime Form	Forte Number	Interval Vector
(012345)	6–1	543210			
(012346)	6–2	4443211			
(012347)	6–Z36	433221	(012356)	6–Z3	433221
(012348)	6–Z37	432321	(012456)	6–Z4	432321
(012357)	6–9	342231			
(012358)	6–Z40	333231	(012457)	6–Z11	333231
(012367)	6–5	422232			
(012368)	6–Z41	332232	(012467)	6–Z12	332232
(012369)	6–Z42	324222	(013467)	6–Z13	324222
(012378)	6–Z38	421242	(012567)	6–Z6	421242
(012458)	6–15	323421			
(012468)	6–22	241422			
(012469)	6–Z46	233331	(013468)	6–Z24	233331
(012478)	6–Z17	322332	(012568)	6–Z43	233331
(012479)	6–Z47	233241	(013568)	6–Z25	233241
(012569)	6–Z44	313431	(013478)	6–Z19	313431
(012578)	6–18	322242			
(012579)	6–Z48	232341	(013578)	6–Z26	232341
(012678)	6–7	420243			
(013457)	6–Z10	333321	(023458)	6–Z39	333321
(013458)	6–14	323430			
(013469)	6–27	225222			
(013479)	6–Z49	224322	(013569)	6–Z28	224322
(013579)	6–34	142422			
(013679)	6–30	224223			
(023679) [5]	6–Z29	224232	(014679)	6–Z50	224232
(014568)	6–16	322431			
(014579) [6]	6–31	223431			
(014589)	6–20	303630			
(023457)	6–8	343230			
(023468)	6–21	242412			
(023469)	6–Z45	234222	(023568)	6–Z23	234222
(023579)	6–33	143241			
(024579)	6–32	143250			
(02468T)	6–35	060603			

33.7 Transposition (T_n)

Transposition is an operation performed as T_n, where n is the number of semitones *up* a set is transposed. For example, [1, 2, 4, 6] at T_4 is [5, 6, 8, 10].

[5] Forte prime form for 6–Z29: (013689)
[6] Forte prime form for 6–31: (013589)



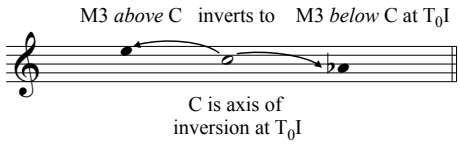
When working in a modulo 12 system, remember that numbers larger than 12 have to be reduced to a number smaller than 12 by subtracting 12 from the larger number. For example, 6, 8, 10, 11 at T_9 would result in 15, 17, 19, 20, which, after subtracting 12 from each number, results in 3, 5, 7, 8.

Table 33.7.1

Pitch classes:		6	8	10	11
at T_9:	+	9	9	9	9
Result:		15	17	19	20
Make numbers modulo 12:	−	12	12	12	12
Result:		3	5	7	8

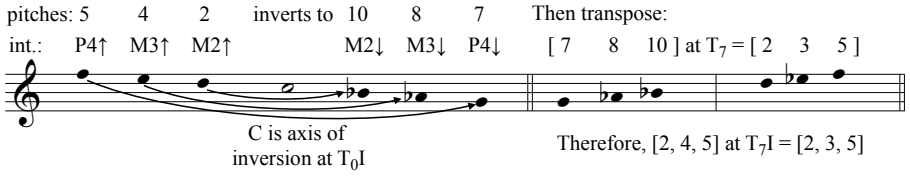
33.8 Inversion (T_nI)

Inverting a set using T_nI is a compound operation. The first step is to invert each note below C using C as an axis. For example, E is a major 3rd above C, so E would invert to A♭, a major third *below* C.



The second step of inversion is to apply the T_n interval. So, to calculate T_3I for the note E, one would first invert E to A♭ (this is T_0I), *then* transpose the A♭ up 3 semitones to B. (Theorist Joseph Straus simplifies the nomenclature to I_n instead of T_nI, but the outcome remains the same.)

Let's try inverting a pitch-class set, applying T_7I to [2, 4, 5] (or D, E, and F). Inverting the notes to the opposite side of C using C as an axis yields pitch numbers 10, 8, and 7 (or B♭, A♭, and G), which in ascending order is 7, 8, and 10. Then transposing [7, 8, 10] at T_7 raises each note 7 semitones, resulting in [2, 3, 5] (or D, E♭, and F).



33.8.1 Identifying T_nI for Inversionally-Related Sets

To determine n of T_nI for two inversionally-related sets, write the second set backward and add the notes of the two sets together. Each sum will equal n. Let's use our two sets from the previous example above: [2, 4, 5] and [2, 3, 5].

Table 33.8.1

First set in order:		2	4	5
Second set backward:	+	5	3	2
n of T_nI:		7	7	7

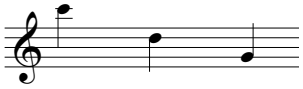
This confirms the sets are related at T_7I.

33.9 Practice Exercises

Exercise Group. Day One

1. Put each set into normal form and prime form.

(a)



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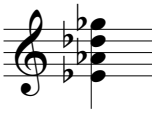
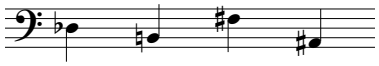
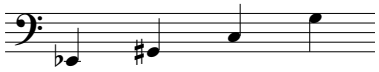


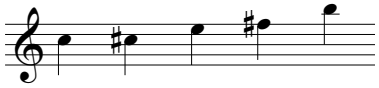
(c)



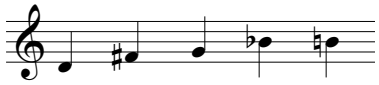
(d)



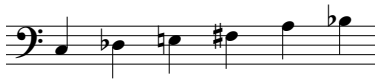
(e)



(f)

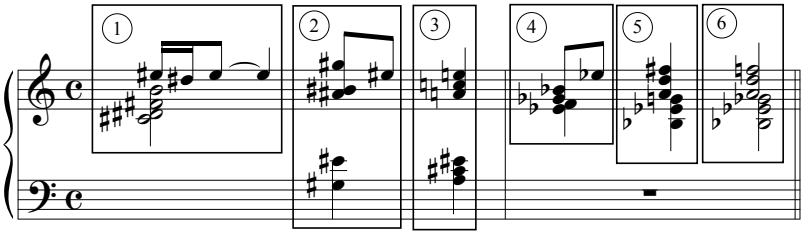


(g)



Exercise Group. Day Two

2. For each of the six sets in the example below, determine the normal form, prime form, Forte number, and interval vector.



Exercise Group. Day Three

3. Transposition (T_n) of Sets. Transpose the following sets as specified.

(a) Transpose [3, 6, 7] at T_2: [___ , ___, ___]

(b) Transpose [2, 4, 8, 9] at T_7: [___ , ___, ___ , ___]

(c) Transpose [1, 2, 4, 7, 8] at T_9: [___ , ___, ___ , ___ , ___]

4. Inversion (T_nI) of Sets. Invert the following sets. Write your answers in normal form.

(a) Invert [7, 10, 11] at T_0I: [___ , ___, ___]

(b) Invert [0, 2, 4] at T_4I: [___ , ___, ___]

(c) Invert [4, 6, 10, 11] at T_9I: [___ , ___, ___ , ___]

5. Specify the interval of inversion from the first set to the second set.

(a) [2, 4, 7] inverts to [3, 6, 8] at what T_nI?

(b) [1, 2, 4, 7] inverts to [4, 7, 9, 10] at what T_nI?

(c) [6, 7, 10, 1, 2] inverts to [3, 4, 7, 10, 11] at what T_nI?

Click here to download the first homework assignment for this chapter.

Click here to download the second homework assignment for this chapter.

Click here to download the third homework assignment for this chapter.

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Chapter 34

Serialism

Serialism is a term that encompasses the twelve-tone technique of Schoenberg, Webern, and Berg, who were the major figures we associated with expressionism and atonality in the previous chapter on set theory. We will begin by discussing classic twelve-tone serialism before discussing non-twelve-tone serialism.

34.1 Twelve-Tone Technique

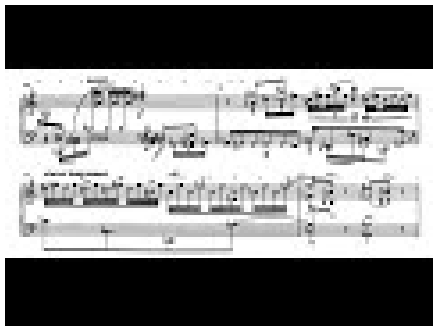


Figure 34.1.1 Arnold Schoenberg, Suite for Piano, Op. 25

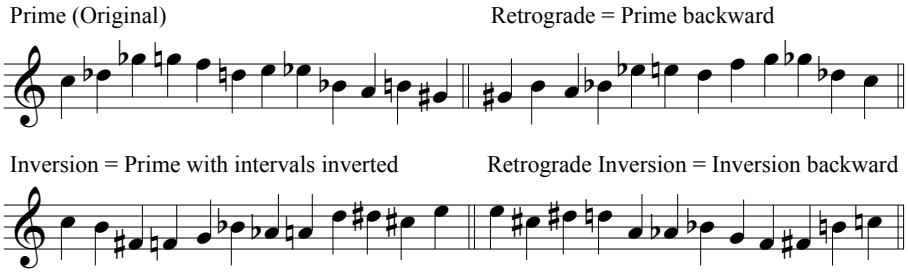
In a twelve-tone composition, every note can be accounted for as being a member of the original series or one of its permutations, providing unity to the piece as a whole. Additionally, a twelve-tone series is a repository of intervals and can be seen as an outgrowth of atonal music with its emphasis on interval over chord or scale. The basic premises of twelve-tone music are as follows:

1. All twelve notes of the chromatic scale must occur
2. No note can be repeated in the series until the other 11 notes of the chromatic scale have occurred (exceptions include direct repetition of a note, trills, and tremolos)
3. The series can be inverted, retrograded, and the inversion can be retrograded
4. The order of notes in a series remains fixed, without reordering.

34.1.1 Row Forms

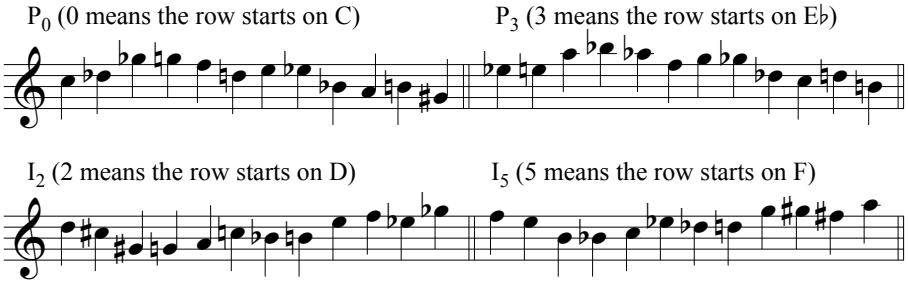
A twelve-tone series is also commonly called a twelve-tone "row," and we will use the term "row" throughout this chapter.

The four types of row forms used in twelve-tone technique are prime (P), retrograde (R), inversion (I), and retrograde inversion (RI). The **prime** is the original row. The **retrograde** is the prime form backward. The **inversion** is the original row with all intervals in the row inverted (going in the opposite direction of the original). Finally, the **retrograde inversion** is the inversion retrograded (and therefore might have more appropriately been labeled "inversion retrograded" since "retrograde inversion" sounds like it refers to the backward form inverted instead of the inverted form backward).

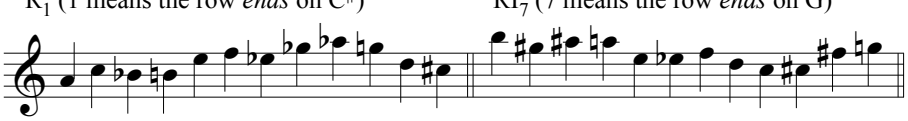


34.1.2 Transposition Numbers

Each row form can be transposed to start on any note from the chromatic scale. We will use the same pitch integers as in set theory. For primes and inversions, we will use P and I accompanied by a pitch integer to specify the starting note. For example, P_0 is a twelve-tone row starting on C (pitch integer 0), P_3 is a twelve-tone row starting on E♭, and so forth. The same is the case for row forms like I_2 (starting on D), I_5 (starting on F), on so forth.



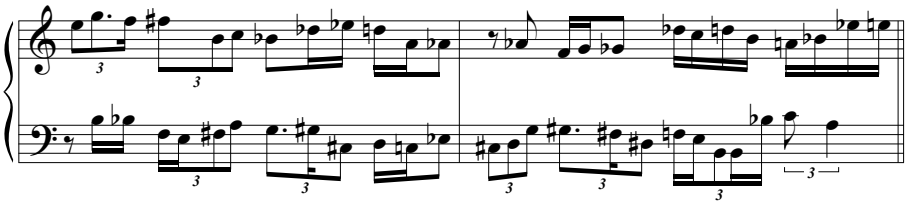
However, the retrograde (R) and retrograde inversion (RI) row forms use the pitch integer of the *last* note in the row to designate their transposition level. Therefore, R_1 *ends* on C♯, and RI_7 *ends* on G.



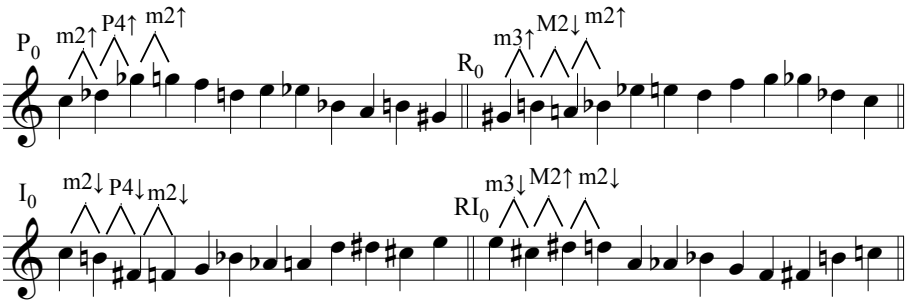
34.2 Determining Row Forms

To determine a row form's permutation and transposition, examine the intervallic composition of each row form. In the example below, each row statement

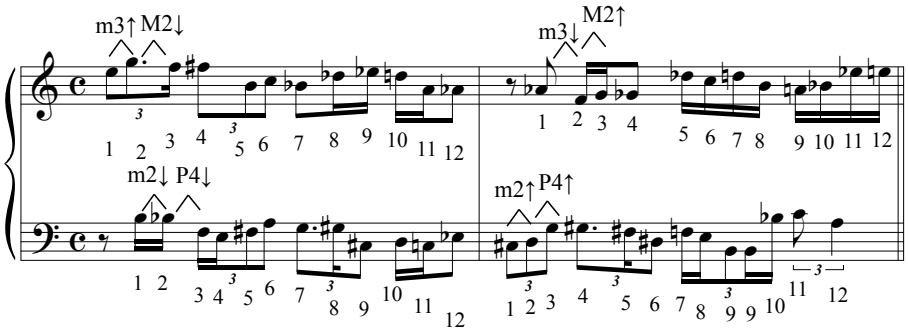
is based on the prime form of the row in the previous sections.



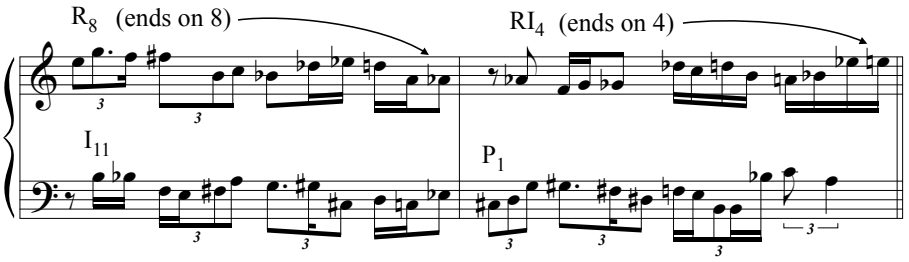
Let's examine the starting intervals of each row form.



In examining the first few notes in the upper staff in the short musical excerpt below, we see an ascending minor 3rd followed by a descending major 2nd. The only row form to start with these intervals is the retrograde. To determine the transposition number, we look at the last note (the 12th note) in the first measure in the upper staff (A♭), which gives us the transposition level (pitch integer 8), meaning this is R_8. The second measure in the upper staff begins with a minor 3rd followed by an ascending major 2nd, making this a retrograde inversion. The 12th note in this measure is an E (pitch integer 4), making this RI_4. In the first measure of the lower staff, we find a descending minor 2nd followed by a descending perfect 4th, making this I_{11}. Finally, the second measure in the lower staff begins on C♯ with an ascending minor 2nd followed by an ascending perfect 4th, making this P_1.



The row forms are labeled in the example below.

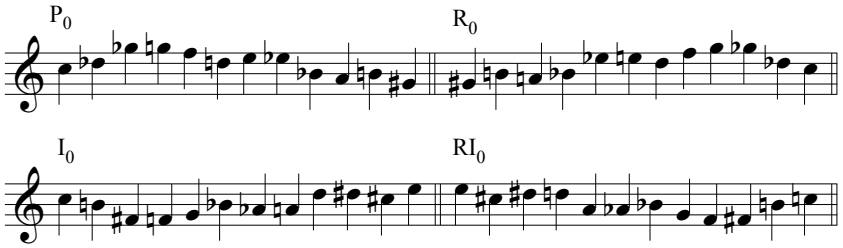


34.3 Writing Row Forms

To write specified row forms from a given prime form, write all four versions of the row: P, R, I, and RI. Then, simply transpose the specified row form to the correct pitch, remembering that P and I forms start on the pitch integer (P_3 and I_3 would begin on E♭, for example) while R and RI forms *end* on the pitch integer (R_3 and RI_3 would end on E♭).

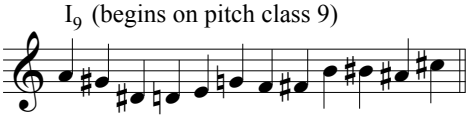
To write I_9 and RI_5 if given P_0:

1. Write all four row forms (P, R, I, RI).

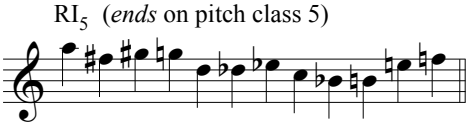


2. Transpose the specified row form to the correct transposition level.

   (a) In this example, transpose I_0 up 9 semitones (a major 6th) to begin on A (pitch class 9).



   (b) To write RI_5, transpose RI_0 up 5 semitones (a perfect 4th) so the last note is F (pitch class 5).



34.4 Twelve-Tone Matrix

One tool analysts create to analyze a twelve-tone composition is a twelve-tone matrix, which shows all 48 row forms in a 12-by-12 grid. Below is a matrix for the row we've been dealing with in this chapter.

Table 34.4.1 Twelve-Tone Matrix

	$I_0\downarrow$	$I_1\downarrow$	$I_6\downarrow$	$I_7\downarrow$	$I_5\downarrow$	$I_2\downarrow$	$I_4\downarrow$	$I_3\downarrow$	$I_{10}\downarrow$	$I_9\downarrow$	$I_{11}\downarrow$	$I_8\downarrow$	
$P_0\rightarrow$	C	D♭	G♭	G	F	D	E	E♭	B♭	A	B	G♯	$\leftarrow R_0$
$P_{11}\rightarrow$	B	C	F	G♭	E	D♭	E♭	D	A	A♭	B♭	G	$\leftarrow R_{11}$
$P_6\rightarrow$	G♭	G	C	D♭	B	A♭	B♭	A	E	E♭	F	D	$\leftarrow R_6$
$P_5\rightarrow$	F	G♭	B	C	B♭	G	A	A♭	E♭	D	E	C♯	$\leftarrow R_5$
$P_7\rightarrow$	G	A♭	D♭	D	C	A	B	B♭	F	E	G♭	E♭	$\leftarrow R_7$
$P_{10}\rightarrow$	B♭	B	E	F	E♭	C	D	D♭	A♭	G	A	F♯	$\leftarrow R_{10}$
$P_8\rightarrow$	A♭	A	D	E♭	D♭	B♭	C	B	F♯	F	G	E	$\leftarrow R_8$
$P_9\rightarrow$	A	B♭	E♭	E	D	B	C♯	C	G	G♭	A♭	F	$\leftarrow R_9$
$P_2\rightarrow$	D	E♭	A♭	A	G	E	F♯	F	C	B	D♭	B♭	$\leftarrow R_2$
$P_3\rightarrow$	E♭	E	A	B♭	A♭	F	G	G♭	D♭	C	D	B	$\leftarrow R_3$
$P_1\rightarrow$	D♭	D	G	A♭	G♭	E♭	F	E	B	B♭	C	A	$\leftarrow R_1$
$P_4\rightarrow$	E	F	B♭	B	A	G♭	A♭	G	D	D♭	E♭	C	$\leftarrow R_4$
	$\uparrow RI_0$	$\uparrow RI_1$	$\uparrow RI_6$	$\uparrow RI_7$	$\uparrow RI_5$	$\uparrow RI_2$	$\uparrow RI_4$	$\uparrow RI_3$	$\uparrow RI_{10}$	$\uparrow RI_9$	$\uparrow RI_{11}$	$\uparrow RI_8$	

To construct a matrix, write the prime form from left to right in the top row, then write the inverted form from top to bottom in the left column.

Table 34.4.2

	$I_0\downarrow$												
$P_0\rightarrow$	C	D♭	G♭	G	F	D	E	E♭	B♭	A	B	G♯	$\leftarrow R_0$
	B												
	G♭												
	F												
	G												
	B♭												
	A♭												
	A												
	D												
	E♭												
$P_1\rightarrow$	D♭												
	E												
	$\uparrow RI_0$												

From there, you can write the transpositions of the prime form, given the starting notes in the left column. One would continue with each transposition of the prime form until the matrix is complete.

34.5 Row Form Presentation in Music

In a piece of music, twelve-tone rows may not be clearly presented. One manner of presentation is overlap, where the final note of one row is the starting note of the next row.

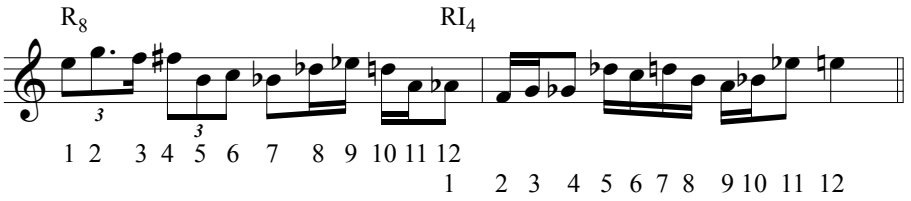


Figure 34.5.1 Twelfth note overlapping with first note in successive row statements

Rows may also be presented contrapuntally or harmonically. In the example below, the row is separated into three tetrachords and presented contrapuntally.

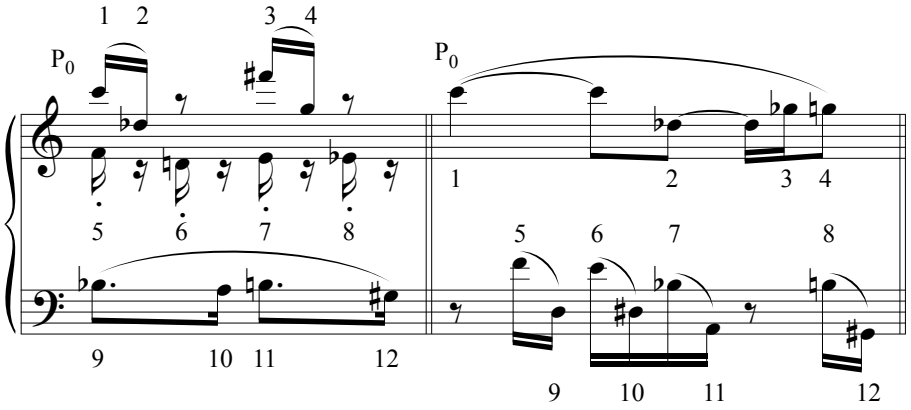
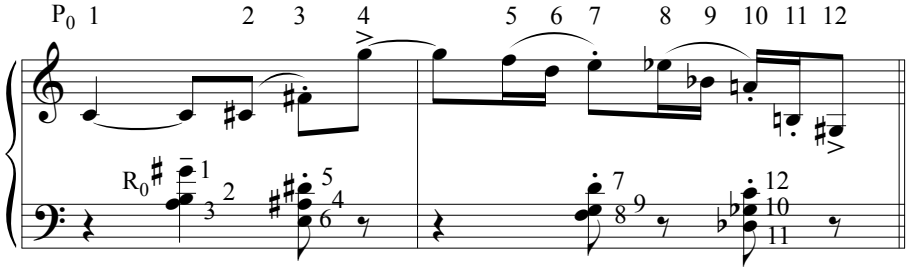


Figure 34.5.2 Two examples of tetrachords from a row presented contrapuntally

In the final example in this section, the two rows are presenting in melody-accompaniment texture, with P_0 containing the melody and R_0 occurring as chords.



An analyst would first attempt to find a clear presentation of a twelve-tone row somewhere in the composition in order to analyze harmonies.

34.6 Non-Twelve-Tone Serialism

Serialism also includes music that is not twelve-tone but does use a series of notes that maintains its order and employs inversion, retrograde, and retrograde inversion of the series. An example is found in Stravinsky's Septet from 1953.[1]

[1]See Erwin Stein, "Strawinsky's Septet (1953)." *Tempo.* Spring, 1954.

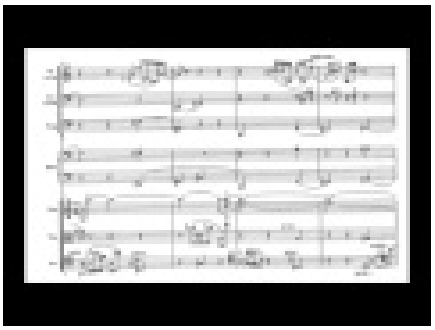


Figure 34.6.1 Stravinsky, Septet

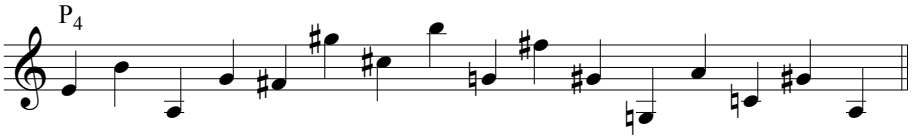


Figure 34.6.2 Series from Stravinsky's Septet

Here is the series with pitch-class integers (abbreviated "pc" for pitch class), and without registral displacement. Arrows connect repeated notes.

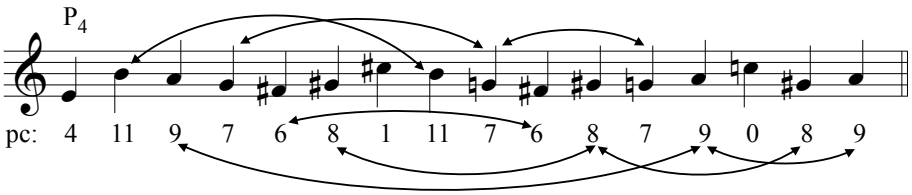


Figure 34.6.3 Series from Stravinsky's Septet showing repeated pitches

We notice that B (pitch integer 11), A (9), G (7), F♯ (6), and G♯ (8) are repeated in the series, with A, G, and G♯ occurring three times each. Below is the normal form of the 8 pitch classes in the 16-note series.

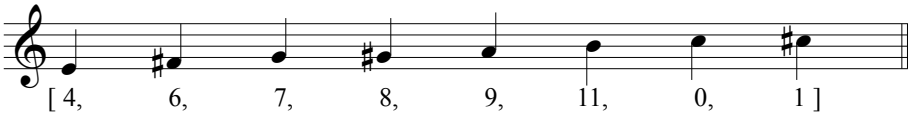


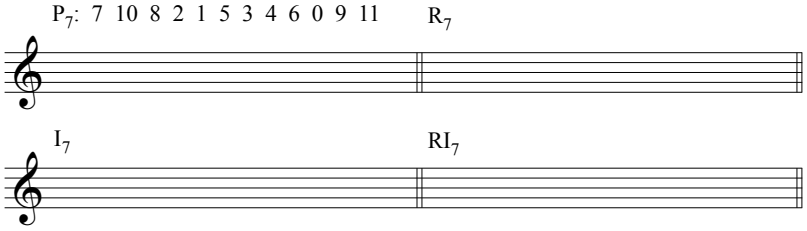
Figure 34.6.4 Normal form of the 8 pitches in the series from Stravinsky's Septet

Such a series could imply E or A as a tonal center. Note that Stravinsky's Septet is not strictly serial but contains serial elements. Such an example shows us that serialism can be employed in ways other than the strict, original twelve-tone version.

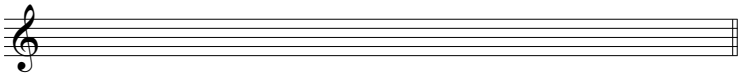
34.7 Practice Exercises

Exercise Group. Serialism: Day One

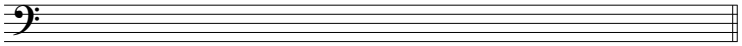
1. Given the prime form of the twelve-tone row in pitch integers, write the specified row forms in the staves below.



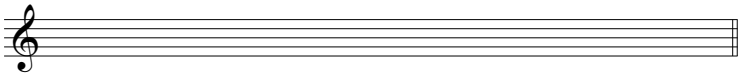
(a) P_1



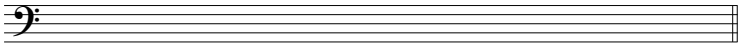
(b) R_4



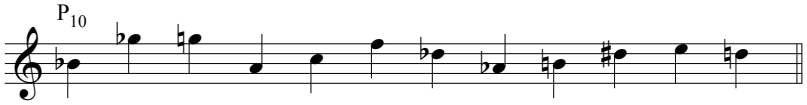
(c) I_8



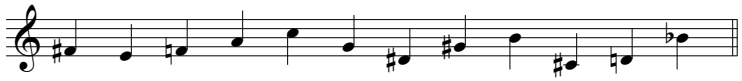
(d) RI_{10}



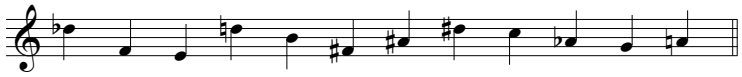
2. Given the prime form of a twelve-tone row, label the row forms and transpositions of the permutations given on the staves below.



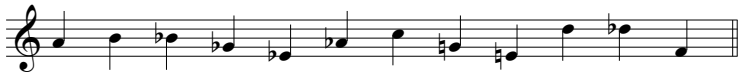
(a) Row form: _____



(b) Row form: _____



(c) Row form: _____



Exercise Group. Serialism: Day Two

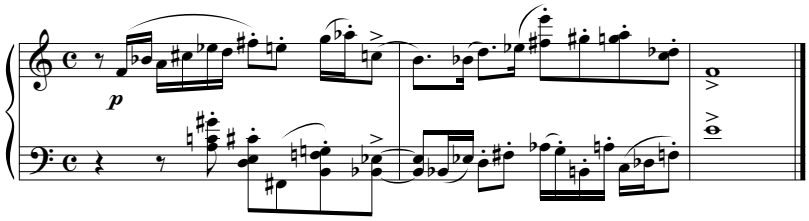
3. Construct a 12 by 12 matrix for the prime form of the following twelve-tone row, given in pitch integers: 3, 7, 11, 1, 5, 0, 2, 10, 6, 4, 8, 9.

Include labels for all row forms including all transposition levels (P_0, R_3, I_8, RI_6, etc.). *Use note names in the matrix*, not integers.

Table 34.7.1

	I_↓	I_↓	I_↓	I_↓	I_↓	I_↓	I_↓	I_↓	I_↓	I_↓	I_↓	I_↓
P_→												
P_→												
P_→												
P_→												
P_→												
P_→												
P_→												
P_→												
P_→												
P_→												
P_→												
P_→												
	↑RI_	↑RI_	↑RI_	↑RI_	↑RI_	↑RI_	↑RI_	↑RI_	↑RI_	↑RI_	↑RI_	↑RI_

4. For the following excerpt, determine P_5 and identify each row form and statement. This example contains overlap.



5. Referring to the twelve-tone row used to construct the matrix in the practice exercise above (3, 7, 11, 1, 5, 0, 2, 10, 6, 4, 8, 9), find the normal form and prime form for each discrete three-note set from the row, and provide an interval vector for each.

(a) Set 1: 3, 7, 11. Normal form: _____ Prime form: _____
Interval vector: _____

(b) Set 2: 1, 5, 0. Normal form: _____ Prime form: _____
Interval vector: _____

(c) Set 3: 2, 10, 6. Normal form: _____ Prime form: _____
Interval vector: _____

(d) Set 4: 4, 8, 9. Normal form: _____ Prime form: _____
Interval vector: _____

Click here to download the first homework assignment for this chapter.
Click here to download the second homework assignment for this chapter.

Chapter 35

Minimalism

The rise of minimalism in the 1960s was a significant development in art music. While four artists are typically associated with minimalism—La Monte Young (b. 1935), Terry Riley (b. 1935), Phillip Glass (b. 1937), Steve Reich (b. 1936)—we will focus on just two techniques in this chapter. The first, additive minimalism, is associated with the early minimalist pieces by Philip Glass. The second, phase shifting, is associated with Steve Reich.

35.1 Additive Minimalism

In Philip Glass's version of additive minimalism as found at the beginning of his composition *Two Pages* (1969), he adds a repetition of a pattern but subtracts the final note in the repetition. Each addition to the pattern is another repetition with the final note of the previous repetition subtracted, as can be seen in the example below. (Note: The music notation below is a transcription and analysis meant to show the additive process and is not necessarily how the music is written in the score.)

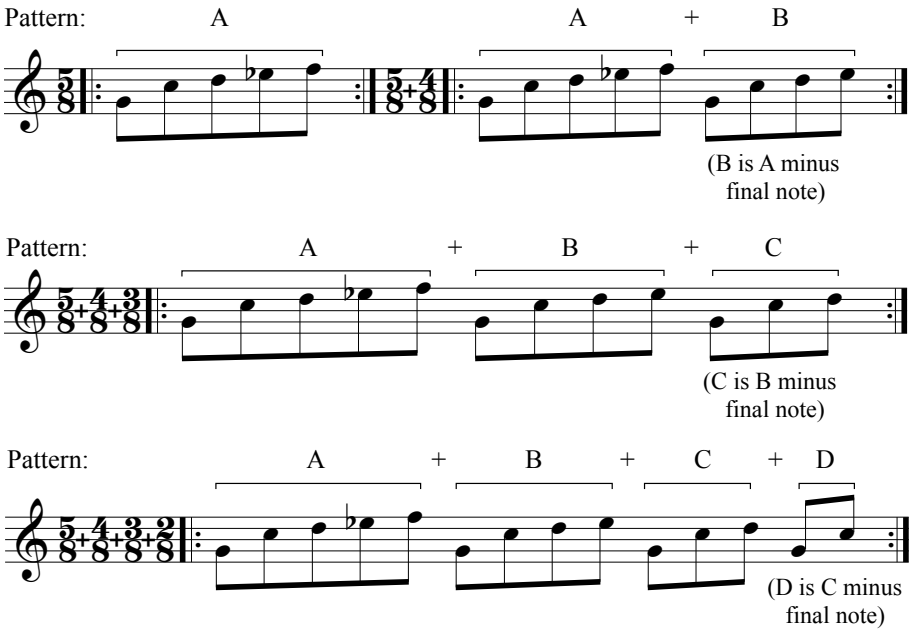


Figure 35.1.1 Glass, *Two Pages* (1969)

The following example from *Music in Fifths* (1969) clearly displays additive process on its own, but is just one of dozens of steps in an additive process.

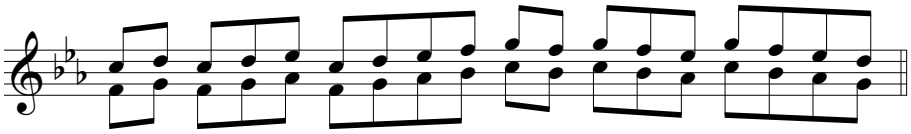


Figure 35.1.2 Glass, *Music in Fifths* (1969)

To hear additive process in Glass's well-known *Einstein on the Beach*, listen to the following minute of music from Act 1, Scene 1, "Train." Each chord in a five–chord cadential progression is gradually lengthened by adding to the number of subdivisions given to each chord.

Figure 35.1.3 Glass, *Einstein on the Beach*

35.2 Phase Shifting

Minimalist composer Steve Reich conceived of phase shifting in his early work in tape music, noting that tape loops of slightly differing lengths containing the same idea went slowly out of phase and very gradually back into phase when they were repeated incessantly (see *It's Gonna Rain* from 1965 and *Come Out*

from 1966). Reich applied this phase–shifting process to live performance in *Piano Phase* (1967), *Violin Phase* (1967), and *Clapping Music* (1972).

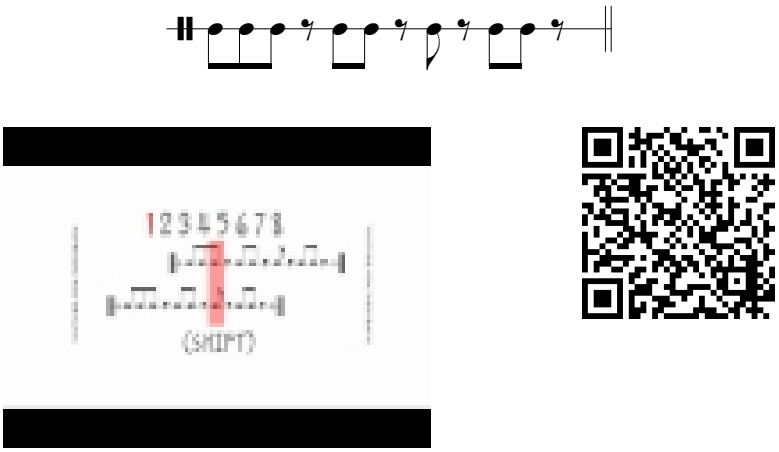
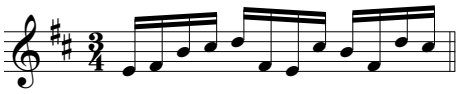


Figure 35.2.1 Reich, *Clapping Music* (1972)

Below is the basic twelve–note pattern of *Piano Phase* along with a video demonstrating the phase–shifting.



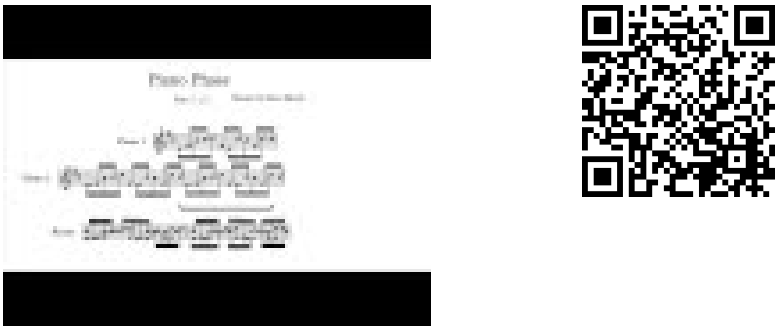


Figure 35.2.2 Reich, *Piano Phase* (1967)

During the phase–shifting process, one can think of the lower voices in the examples above as going through rotation. The example below shows rotation of a five–note pattern. The pattern rotates one note to the left, meaning the second note begins the pattern on the second line, the third note begins the pattern on the third line, etc., until the first note starts the pattern again to complete the phase–shifting process.

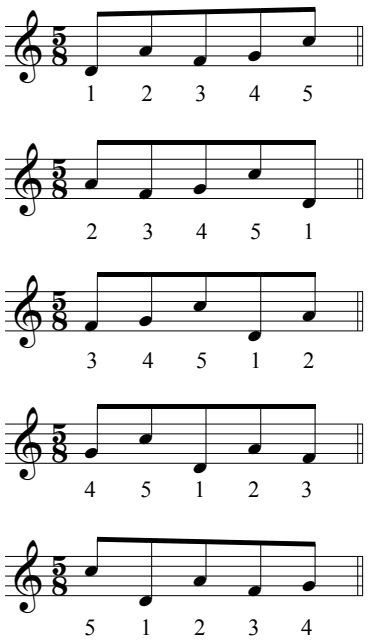


Figure 35.2.3 Rotation demonstrated with a five–note pattern

In a piece of music, the process would play out similar to the manner below, where one part maintains the original pattern while the second goes out of phase by continually rotating the original pattern one note to the left. In *Piano Phase*, Reich has the second pianist gradually increase in speed so the patterns go slowly out of phase, while in *Clapping Music*, Reich has the musicians change to the next rotation on the downbeat of a measure, without gradually speeding up.

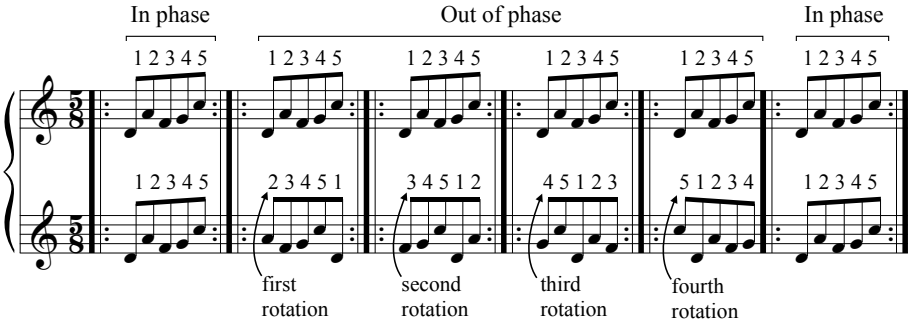


Figure 35.2.4 A short phase–shifting process piece

One hears phase shifting in numerous works by Reich, including the second movement of his *Three Movements*.

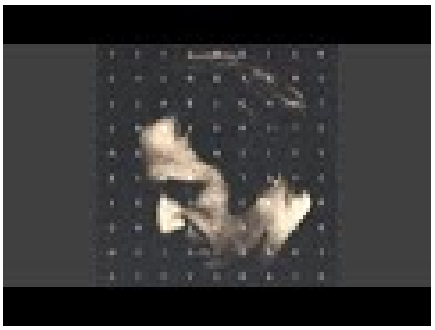


Figure 35.2.5 Reich, *Three Movements*, II.

It is worth mentioning that composers like Stravinsky applied rotation to serialism, which Joseph Straus details in Chapter 6 of his *Introduction to Post–Tonal Analysis* (4th edition).

35.3 Homework Assignments

Click here to download the first homework assignment for this chapter.

Click here to download the second homework assignment for this chapter.

Click here to download the Unit 12 Practice Test.

Appendix A

Answers to Practice Exercises

1 · Basic Concepts
1.6 · Practice Exercises

1.6.1. 1. A0, 2. F1, 3. D2, 4. G2, 5. B3, 6. E4, 7. A4, 8. G5, 9. A6, 10. B7

1.6.2. 1. E5, 2. D6, 3. F4, 4. G3, 5. A4, 6. E4, 7. G3, 8. A2, 9. E4, 10. E4, 11. G3, 12. C4

1.6.3. 1. $G^{\flat\flat}$ and $E^{\sharp}$; 2. $D^{\sharp}$ and $F^{\flat\flat}$; 3. $G^{\times}$ and $B^{\flat\flat}$; 4. $G^{\flat}$ and $E^{\times}$

2 · Major Scales and Key Signatures
2.4 · Practice Exercises

2.4.1. 1. $D^{\flat}$ $E^{\flat}$ F $G^{\flat}$ $A^{\flat}$ $B^{\flat}$ C
2. A B $C^{\sharp}$ D E $F^{\sharp}$ $G^{\sharp}$

2.4.2. 1. $A^{\flat}$; 2. A; 3. G; 4. $E^{\flat}$; 5. F; 6. D; 7. $C^{\sharp}$;
8. E; 9. $B^{\flat}$; 10. $D^{\flat}$; 11. $F^{\sharp}$; 12. B; 13. $C^{\flat}$; 14. $G^{\flat}$

3 · Minor Scales and Key Signatures
3.4 · Practice Exercises

3.4.1. 1. $e^{\flat}$; 2. b; 3. $c^{\sharp}$; 4. g; 5. f; 6. e; 7. $b^{\flat}$;
8. $f^{\sharp}$; 9. $a^{\flat}$; 10. $a^{\sharp}$; 11. d; 12. $g^{\sharp}$; 13. c; 14. $d^{\sharp}$

3.4.4.

(a) f

(b) $e^{\flat}$

(c) E

(d) $E^{\flat}$

(e) $a^{\sharp}$

(f) $C^{\flat}$

(g) $d^{\sharp}$

4 · Basics of Rhythm
4.7 · Practice Exercises

4.7.1.

(a) Compound Duple (or Compound Quadruple)

(b) Simple Quadruple (or Simple Duple)

(c) Simple Triple

(d) Compound Triple

(e) Compound Duple (or Compound Quadruple

4.7.2. a. Time Signature: $\frac{12}{16}$; Meter: Compound Quadruple
b. Time Signature: $\frac{3}{2}$; Meter: Simple Triple
c. Time Signature: $\frac{3}{8}$; Meter: Simple Triple
d. Time Signature: $\frac{4}{2}$; Meter: Simple Quadruple

4.7.3. 1. Dotted quarter note
2. Eighth note
3. Dotted eighth note
4. Half note

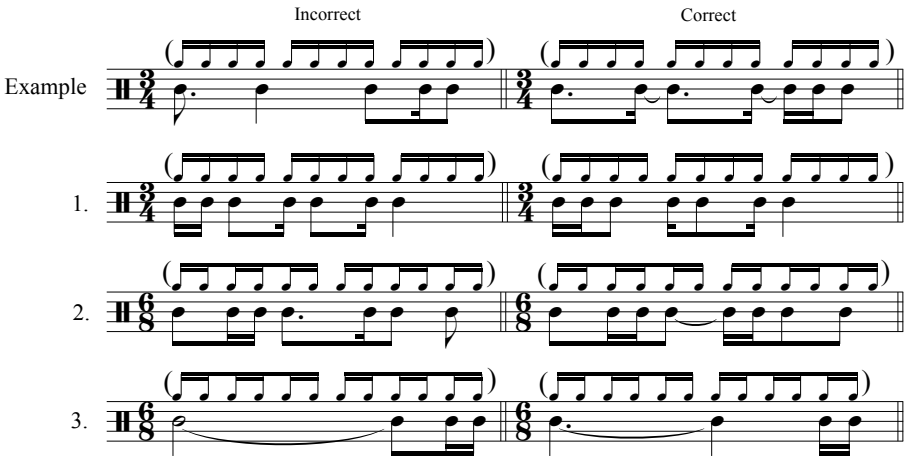
4.7.4.

(a) The meter of $\frac{4}{2}$ is *simple quadruple*

(b) The meter of $\frac{9}{16}$ is *compound triple*

(c) The meter of $\frac{3}{4}$ is *simple triple*

4.7.5.



5 · Intervals
5.6 · Practice Exercises

5.6.1. 1. 6, 2. 4, 3. 2, 4. 8, 5. 7

5.6.2. 1. M6, 2. M3, 3. M2, 4. P5, 5. P8, 6. +4

5.6.3. Upper notes: 1. $D^{\flat}$, 2. $G^{\flat}$, 3. $A^{\sharp}$, 4. B, 5. A, 6. $F^{\flat}$

5.6.4. Lower notes: 1. $G^{\sharp}$, 2. E, 3. F, 4. $G^{\flat}$, 5. $F^{\sharp}$, 6. B

6 · Triads
6.7 · Practice Exercises

6.7.1. 1. $A^{\sharp\circ}$, 2. Fsus4, 3. $B^{\flat}+$, 4. $D^{\flat}$, 5. Esus2

6.7.2. 1. $BDF^{\sharp}$, 2. $EG^{\sharp}B^{\sharp}$, 3. $A^{\flat}B^{\flat}E^{\flat}$, 4. $C^{\sharp}E^{\sharp}G^{\sharp}$, 5. DGA, 6. $FA^{\flat}C^{\flat}$

6.7.3. 1. Dm/F, 2. Gm/D, 3. $A^{\sharp\circ}/C^{\sharp}$, 4. F/A, 5. $B^{\flat}/F$, 6. Cm/G

6.7.4. (lowest to highest) 1. DGB, 2. $DF^{\sharp}B$, 3. $FA^{\flat}D^{\flat}$, 4. $B^{\flat}EG$

6.7.5. 1. $F^{\sharp}A^{\sharp}C^{\sharp}$, 2. $GB^{\flat}D^{\flat}$, 3. $A^{\flat}C^{\flat}E^{\flat}$

7 · Roman Numerals and Cadences
7.5 · Practice Exercises

7.5.1. 1. $F^{\sharp}m$, ii; 2. $D^{\sharp\circ}/F^{\sharp}$, vii°/3rd; 3. A, VII; 4. G, V; 5. $Bm/F^{\sharp}$, ii/5th

7.5.2. 1. C, $CE^{\natural}G$; 2. G/D, DGB; 3. A°, $A^{\natural}CE^{\flat}$

7.5.3. a. "Columbia, the Gem of the Ocean": 1. G, I; 2. D, V; 3. G, I; 4. C, IV; 5. G, I; 6. D, V; Cadence type = Half Cadence (HC)

b. "Could You Be Loved": 1. D, I; 2. Bm, vi; 3. G, IV; 4. D, I; Cadence type = Plagal Cadence (PC)

8 · Seventh Chords
8.4 · Practice Exercises

8.4.1. 1. D^{7}, V^{7}
2. $G\Delta^{7}$, IV^{M7}
3. $D^{\sharp\emptyset 7}$, $ii^{\emptyset 7}$
4. Bm^{7}/D, iii^{7}/3rd
5. $C^{\sharp\circ 7}/E$, $vii^{\circ 7}$/3rd

8.4.2. 1. Bm7, B-D-F♯-A
2. $A^{\emptyset 7}$, A-C-E♭-G
3. $C^{\sharp\emptyset 7}$, C♯-E-G-B
4. G^{7}, G-B♮-D-F
5. $Emaj^{7}/G\sharp$, G♯-B-D♯-E

8.4.3. a. "No Scrubs": 1. $D^{\flat}m^{7}$, iv^{7}; 2. $A^{\flat}m$, i; 3. $E^{\flat 7}$, V^{7}; 4. $A^{\flat}m$, i

b. Mozart: 1. C, I; 2. G^{7}/D, V^{7}/5th; 3. C, I; 4. F/C, IV/5th; 5. C, I; 6. G^{7}/B, V^{7}/3rd; 7. C, I; Cadence type: Authentic Cadence (AC)

9 · Harmonic Progression and Harmonic Function
9.9 · Practice Exercises

Day One.

9.9.1. In F major:
1. F-A-C
2. IV = B♭-D-F
3. vii^{o} = E-G-B♭
4. iii = A-C-E
5. vi = D-F-A
6. ii = G-B♭-D
7. V = C-E-G
8. F-A-C

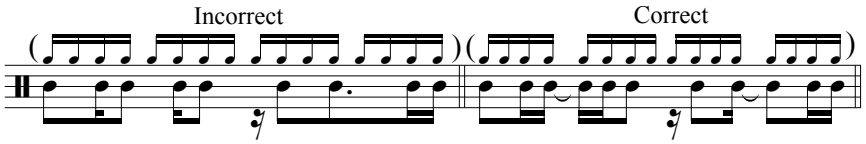
In B minor:
1. B-D-F♯

2. iv = E-G-B
3. VII = A-C♯-E
4. III = D-F♯-A
5. VI = G-B-D
6. ii^{o} = C♯-E-G
7. V = F♯-A♯-C♯
8. B-D-F♯

9.9.2. 1. A𝄫, 2. A♯, 3. D, 4. C♯, 5. G, 6. G

9.9.3. 1. 4 flats in key signature, iv, B♭-D♭-F
2. 3 sharps in key signature, IV, D-F♯-A
3. 3 flats in key signature, ii^{o}/3rd, F-A♭-D
4. 4 sharps in key signature, vi, C♯-E-G♯
5. 2 flats in signature, vii^{o}7, F♯-A-C-E♭
6. 5 sharps in key signature, V7/5th, C♯-E-F♯-A♯
7. 1 flat in key signature, i/3rd, F-A-D
8. 1 flat in key signature, iii, A-C-E

9.9.4.

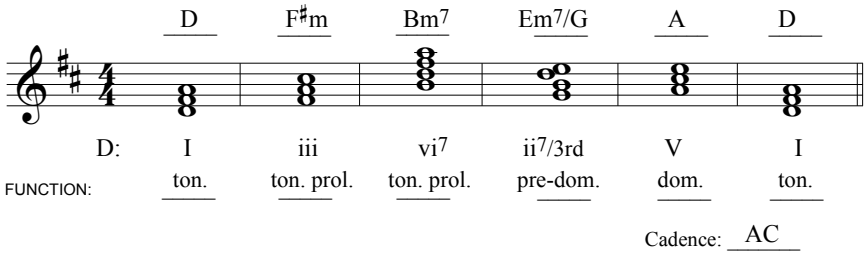


9.9.5. HC = V
DC = V-vi
PC = IV-I
AC = V-I

9.9.6.

In F major:	In E major:
1. F, I	1. C♯m, vi
2. Dm, vi	2. A, IV
3. Gm/B♭, ii/3rd	3. E, I
4. C, V	4. B, V

9.9.7.



10 · Non-Chord Tones
10.12 · Practice Exercises

10.12.1.

Non-Chord Tone Type	*Approached by*	*Left by*
RETARDATION	same tone	step up
ESCAPE TONE	*STEP*	leap in opposite direction
PASSING TONE	step	step in same direction
APPOGGIATURA	leap	*STEP*

10.12.2. a. "Stop! In the Name of Love" example

Lead-sheet symbols: Am, G/B, F, G

Roman numerals: vi, V/3rd, IV IVM7, V

Measure 2: 7-6 suspension in voice part and in right hand of piano, appoggiatura in left hand of piano

Measure 3: 9-8 suspension (or incomplete neighbor) in voice part and right hand of piano

Measure 4: 6-5 suspension in voice and right hand of piano

b. Robert Schumann example

Pickup measure: appoggiatura in right hand of piano;

Measure 1: appoggiatura in left hand of piano; 7-6 suspension, appoggiatura in right hand of piano; Roman numeral: iv/3rd

Measure 2: appoggiatura in right hand; Roman numeral: V7

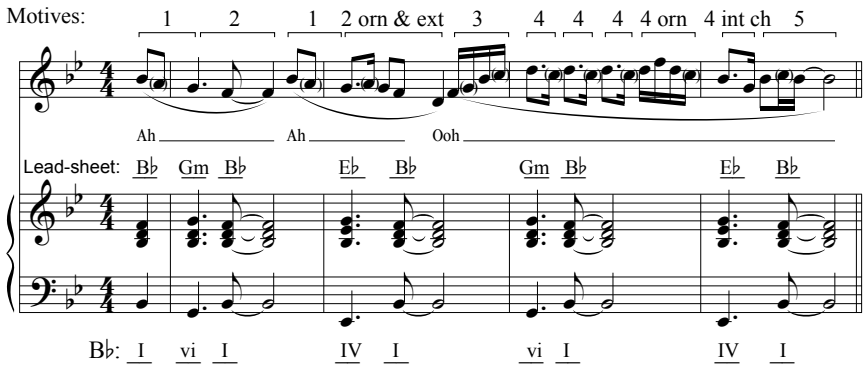
Measure 3: 7-6 suspension, appoggiatura in voice part; 7-6 suspension, appoggiatura in right hand of piano; Roman numeral: ii/3rd, V7, Lead-sheet symbol: E7

Measure 4: 4-3 suspension; appoggiatura in right hand; Roman numeral: I, Lead-sheet symbol: A

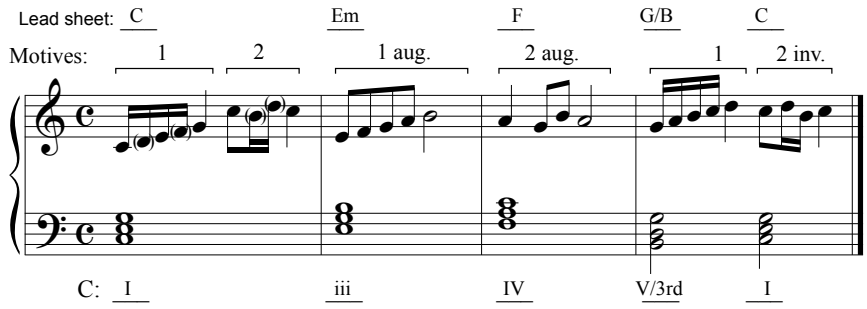
11 · Melodic Analysis

11.6 · Practice Exercises

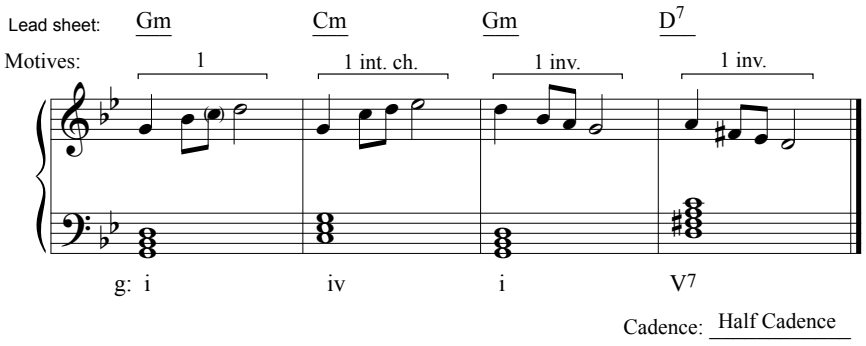
11.6.1.



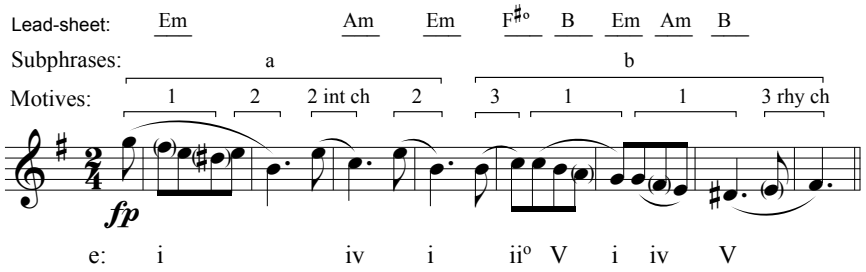
11.6.2.



11.6.3.



11.6.4.



12 · Form in Popular Music
12.6 · Practice Exercises

12.6.1. She's Out of My Life:

- 0:00–0:40, Introduction, approx. 4 bars of keyboard
- 0:40–1:25, A, 12 bars
- 1:25–2:05, A, 11 bars
- 2:05–2:35, B, 8 bars
- 2:35–3:33, A, 13 bars

Penny Lane:

- 0:00–0:20, Verse 1, 8 bars
- 0:20–0:38, Verse 2, 8 bars
- 0:38–0:54, Chorus, 8 bars
- 0:54–1:11, Verse 3, 8 bars
- 1:11–1:28, Trumpet Solo on Verse progression, 8 bars
- 1:28–1:45, Chorus, 8 bars
- 1:45–2:02, Verse 4, 8 bars
- 2:02–2:19, Verse 5, 8 bars
- 2:19–2:36, Chorus, 8 bars
- 2:36–3:02, Chorus a whole step higher, 9 bars

13 · Phrases in Combination
13.9 · Practice Exercises

13.9.1. Mozart, "Ein Mädchen oder Weibchen,"*The Magic Flute*.
Mozart, *The Magic Flute*, "Ein Mädchen oder Weibchen":

- Chords: I–V, V–I
- Cadences: HC, PAC
- No Sentences
- Melodic labels: *a*, *b*
- Form: contrasting period

13.9.2. Mozart, Piano Sonata K. 333, I.
Mozart, Piano Sonata K. 333, I:

- Chords: vii°–I, vi–V, vii°–I, V–I
- Cadences: IAC, HC, IAC, PAC
- The 2nd phrase is a sentence
- Melodic labels: *a*, *b*, *a*, *b'*
- Form: parallel double period

13.9.3. Edmond Dédé, *Chicago, Grande Valse à l'Américaine*.
Dédé, *Chicago*:

- Chords: V, V, V, V–I
- Cadences: HC, HC, HC, PAC
- All four phrases are sentences
- Melodic labels: *a*, *a*, *a*, *a'*
- Form: parallel double period

16 · Figured Bass
16.6 · Practice Exercises

16.6.1.

- Lead-sheet: 1. C/G; 2. B°/D; 3. Dm/A; 4. G
- Figured bass: 1. I^6_4; 2. $vii^{\circ 6}$; 3. ii^6_4; 4. V

16.6.2.

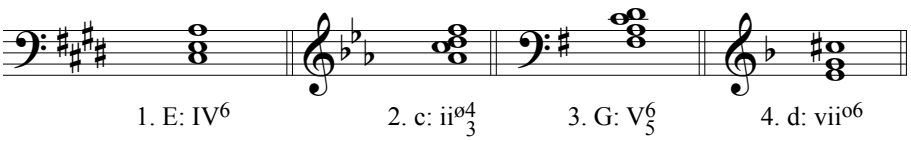
- Lead-sheet: 1. Em7/G; 2. G7/F; 3. Cmaj7/G; 4. Fmaj7
- Figured bass: 1. iii^6_5; 2. V^4_2; 3. IM^4_3; 4. IVM^7

16.6.3.

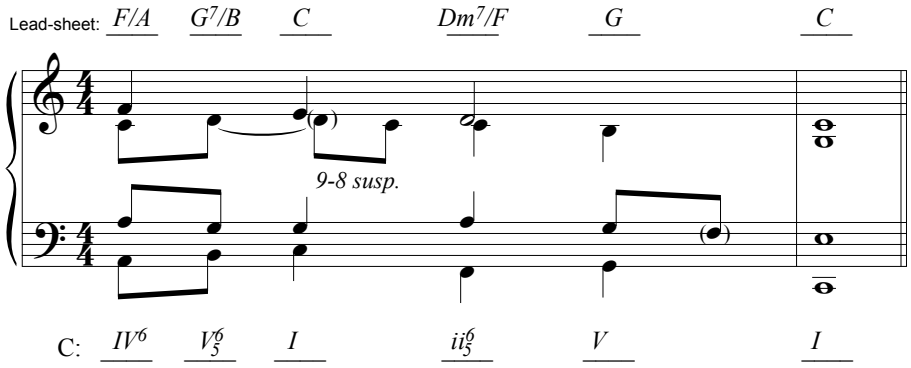
- Lead-sheet: 1. D°/F; 2. $A^{\sharp\circ 7}/G$; 3. $E^{\emptyset 7}$; 4. $Dmaj7/F^{\sharp}$

- Figured bass: 1. $\text{ii}^{\circ 6}$; 2. $\text{vii}^{\circ 4}_{2}$; 3. $\text{vii}^{\circ 7}$; 4. IM^{6}_{5}

16.6.4.



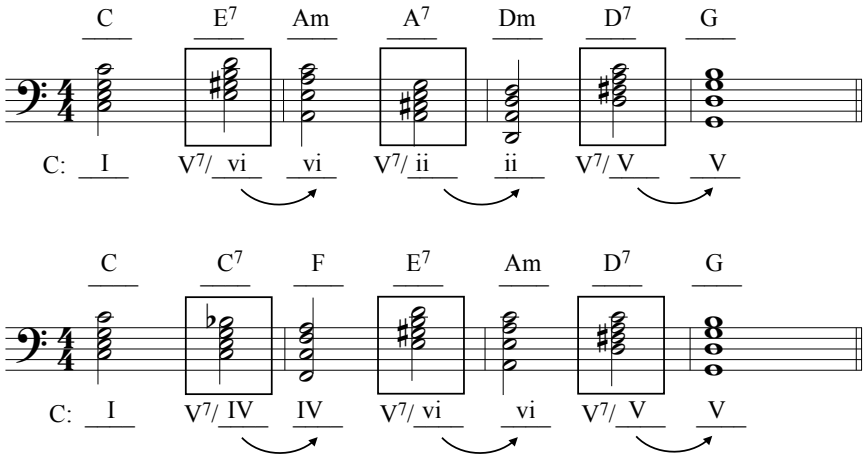
16.6.5.



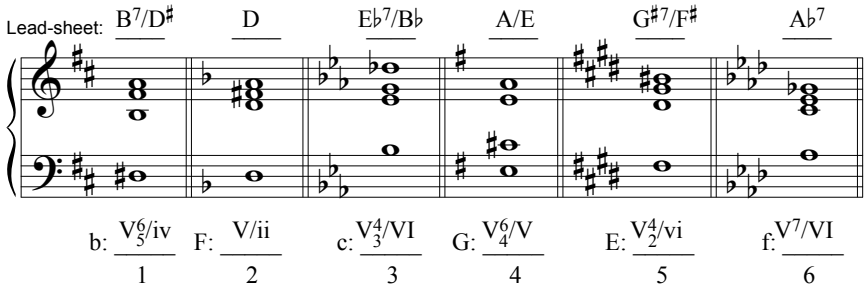
17 · Secondary Dominant Chords

17.7 · Practice Exercises

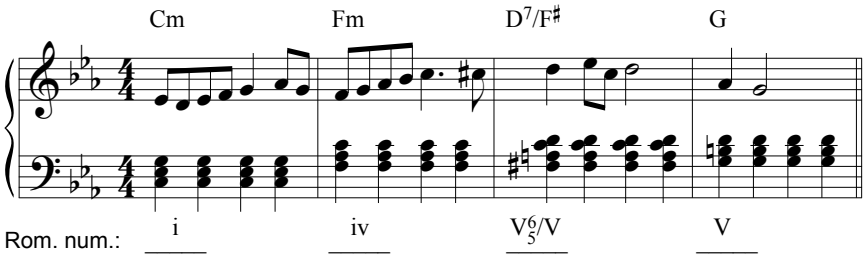
17.7.1.



17.7.2.



17.7.3.



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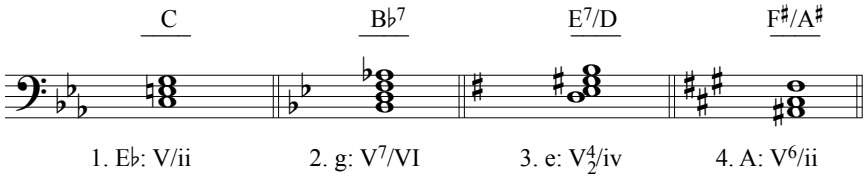
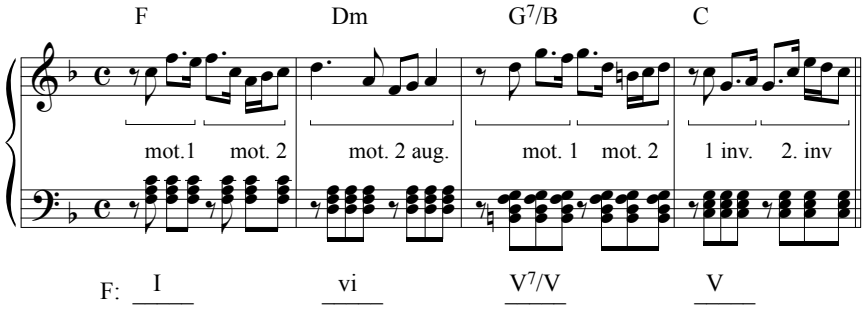
17.7.4.



17.7.5.



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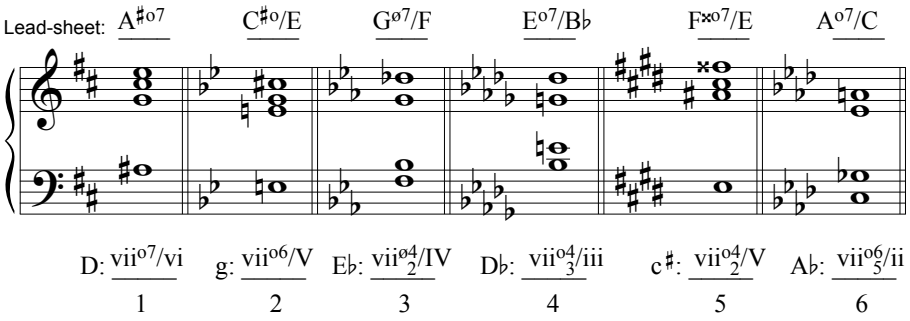
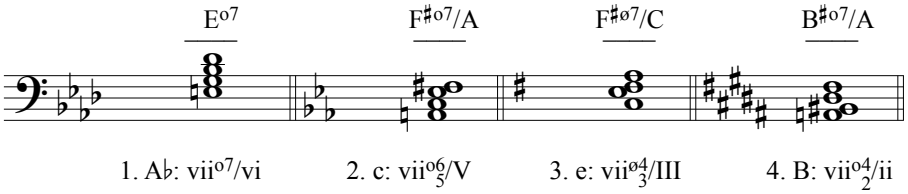
18 · Secondary Diminished Chords

18.5 · Practice Exercises

18.5.1.



18.5.2.



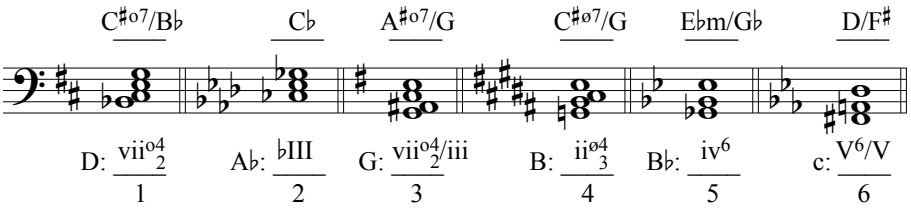
18.5.3.

- Lead–sheet: 1. F; 2. Am; 3. B♭; 4. F♯∘7; 5. D/F♯; 6. Gm
- Figured bass: 1. I; 2. iii; 3. IV; 4. vii∘7/ii; 5. V6/ii; 6. ii

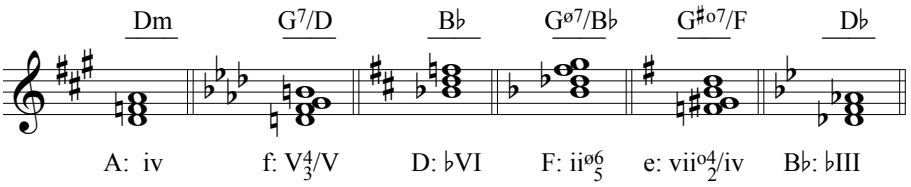
19 · Mode Mixture

19.6 · Practice Exercises

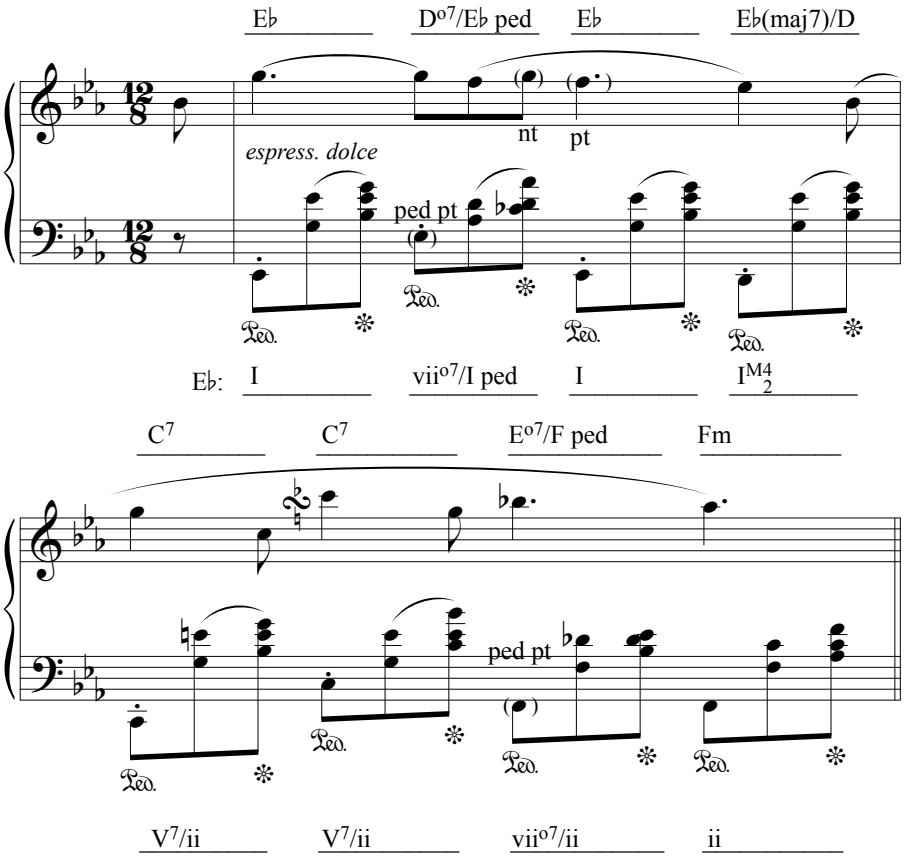
19.6.1.



19.6.2.

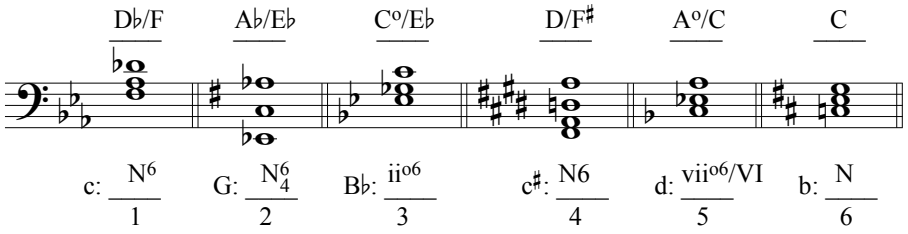


19.6.3.

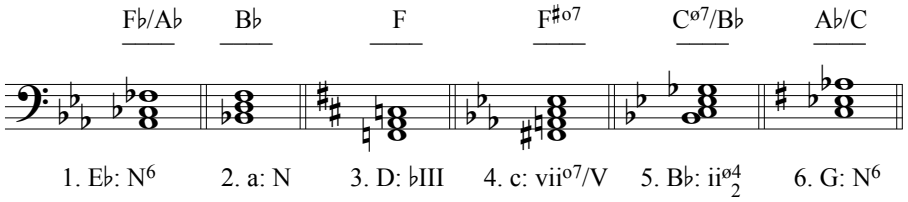


20 · The Neapolitan Chord
20.3 · Practice Exercises

20.3.1.

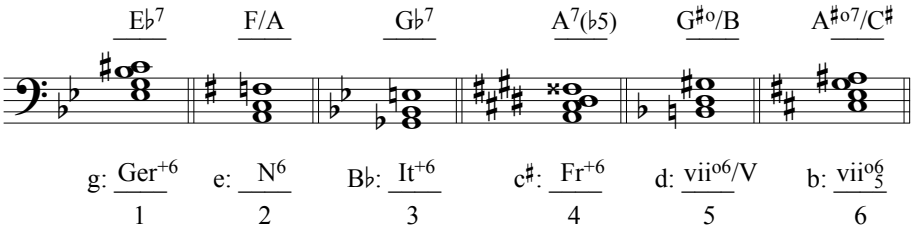


20.3.2.

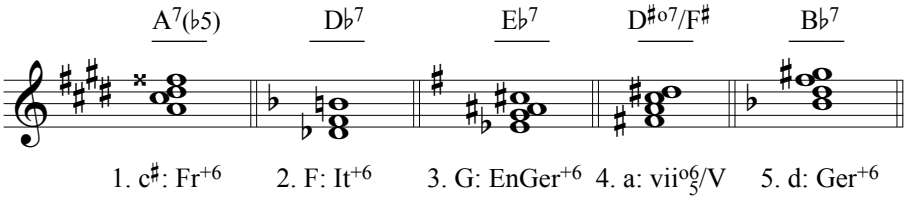


21 · Augmented Sixth Chords
21.9 · Practice Exercises

21.9.1.



21.9.2.



22 · Modulation

22.8 · Practice Exercises

22.8.1.

(a) d: F, g, a, B♭, C

(b) D♭: e♭, f, G♭, A♭, b♭

(c) f: A♭, b♭, c, D♭, E♭

22.8.2.

Lead-sheet symbols: F C7/B♭ F/A Dm C/E Dm/F C/G G7 C

Roman numerals: F: I V^4_2 I^6 vi

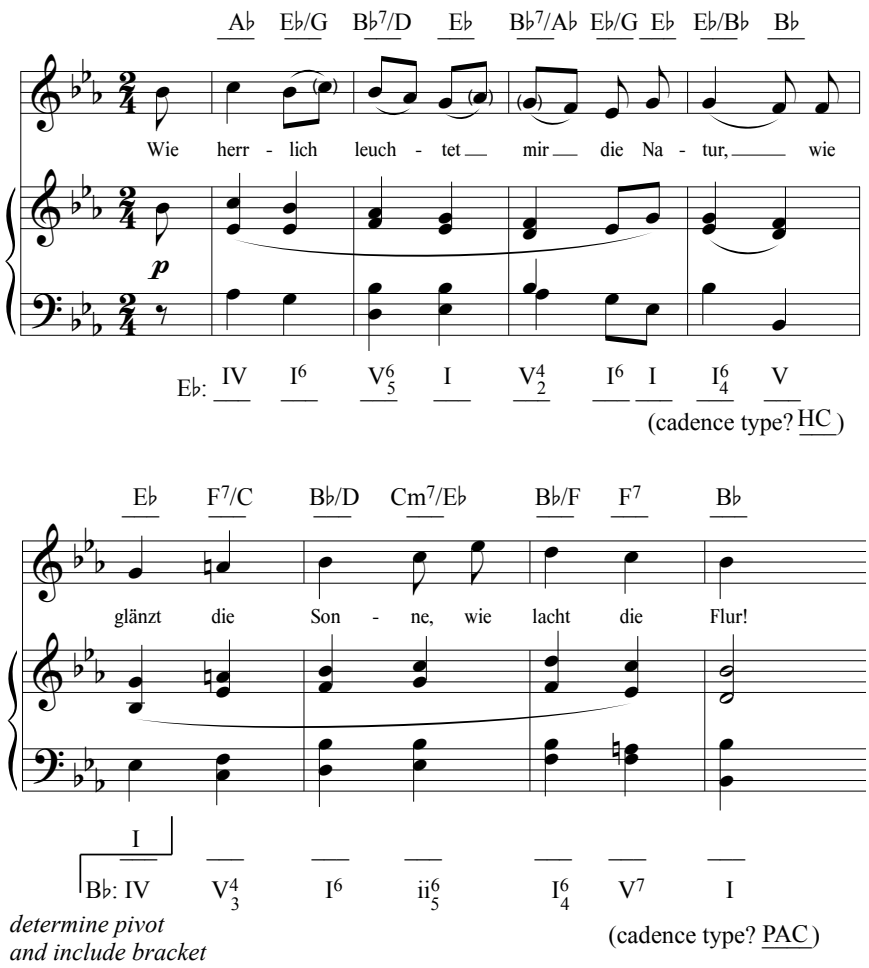
C: ii I^6 ii^6 I^6_4 V^7 I

Lead-sheet symbols: Gm G/B Cm Cm/E♭ E♯ø7 B♭/F F7 B♭

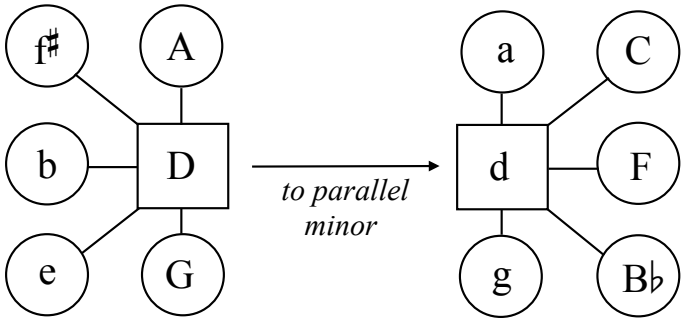
Roman numerals: g: i V^6/iv iv iv^6

B♭: ii^6 viiø7/V I^6_4 V^7 I

22.8.3.


A♭ E♭/G B♭7/D E♭ B♭7/A♭ E♭/G E♭ E♭/B♭ B♭
Wie herr - lich leuch - tet mir die Na - tur, wie
p
E♭: IV I6 V65 I V42 I6 I I64 V
(cadence type? HC)
E♭ F7/C B♭/D Cm7/E♭ B♭/F F7 B♭
glänzt die Son - ne, wie lacht die Flur!
I
B♭: IV V43 I6 ii65 I64 V7 I
determine pivot
and include bracket
(cadence type? PAC)

22.8.4.


f♯
A
b
D
e
G
to parallel
minor
a
C
d
F
g
B♭

22.8.5.

Lead-sheet symbols: A C A A^7/G Dm/F $B♭^7$ Dm/A A^7 B♭

Roman numerals: A: I ♭III I V^4_2/IV

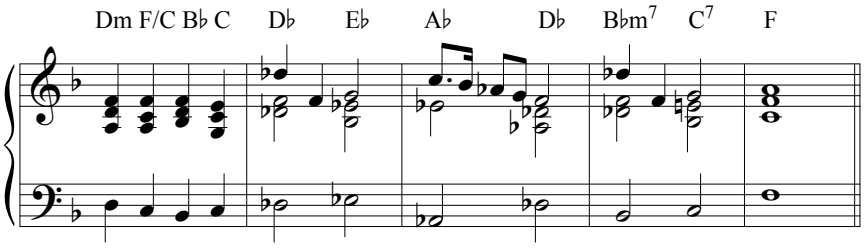
d: V^4_2 i^6 Ger^{+6} i^6_4 V^7 VI

Lead-sheet symbols: Gm Gm/B♭ A♭/C B♭m/D♭ D^{o7} A♭/E♭ E^{o7} Fm

Roman numerals: g: i i^6 N^6

A♭: I^6 ii^6 vii^{o7}/V I^6_4 vii^{o7}/vi vi

22.8.6.



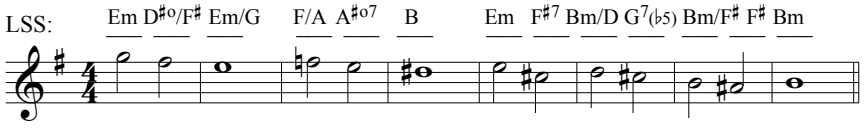
F: vi I^6_4 IV V ♭VI iv^7 V^7 I

A♭: IV V I IV ii^7

22.8.7.

Roman numerals:	d:	i	ii^o	III	iv	V	VI	vii^o
Lead-sheet symbols in Dm:		Dm	E^o	F	Gm	A	B♭	C$^{♯o}$
Lead-sheet symbols in F:		Dm	E^o	F	Gm	Am	B♭	C
Roman numerals:	F:	vi	vii^o	I	ii	iii	IV	V

22.8.8.



RN: e: i vii^{o6} i^6 N^6 vii^{o7}/V V i

b: iv V^7 i^6 Fr^{+6} i^6_4 V i

HF: Ton Dom Ton PD PD/V Dom PD Dom Ton PD Cad^6_4 Dom Ton

22.8.9.

(a) Fm: Am, A♭m, Dm, D♭m

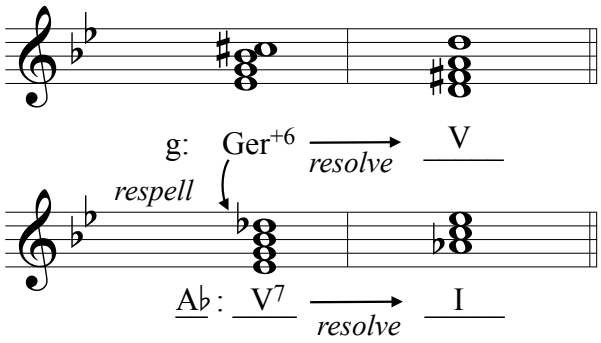
(b) D♭: F♭, F, B♭, B𝄫 (or A, enharmonically)

(c) G: B♭, B, E, E♭

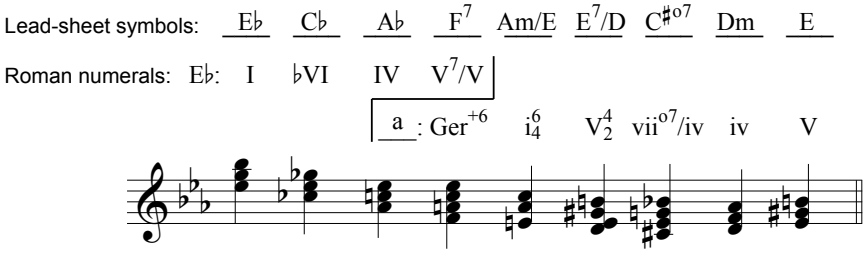
(d) G♯m: Bm, B♯m, Em, E♯m

23 · Enharmonic Modulation
23.4 · Practice Exercises

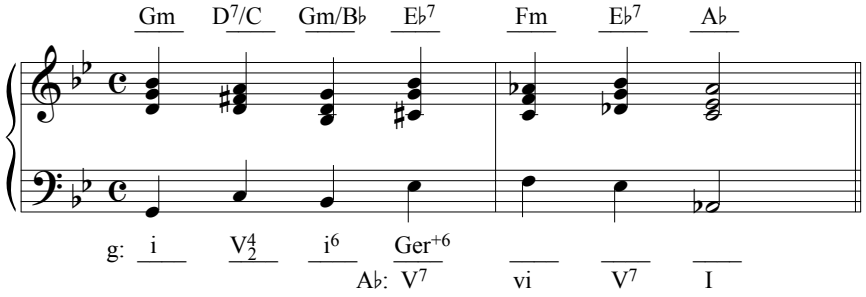
23.4.1.



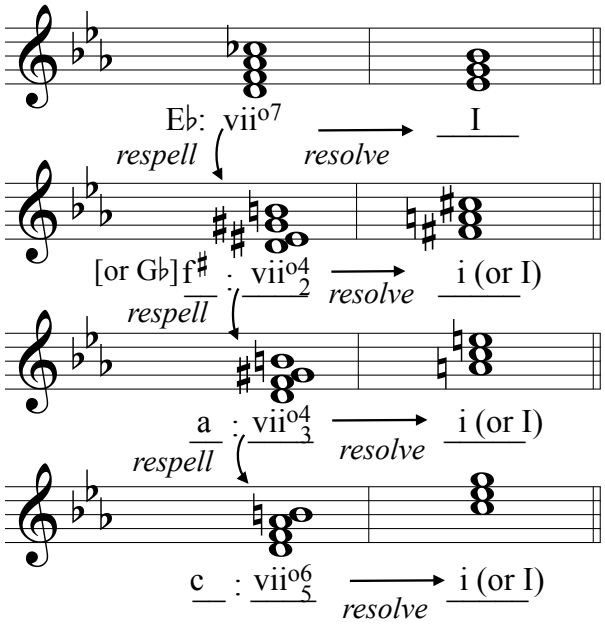
23.4.2.



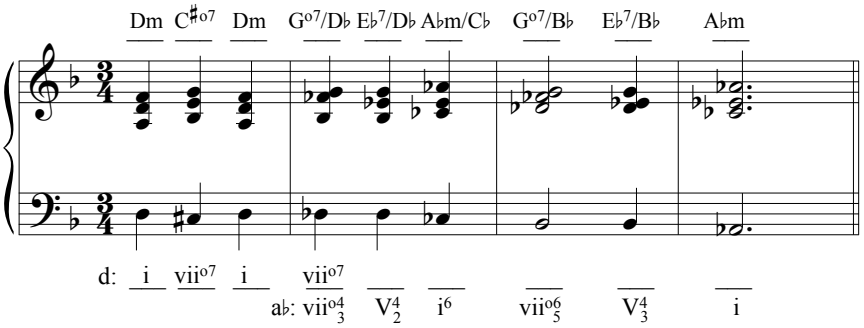
23.4.3.



23.4.4.

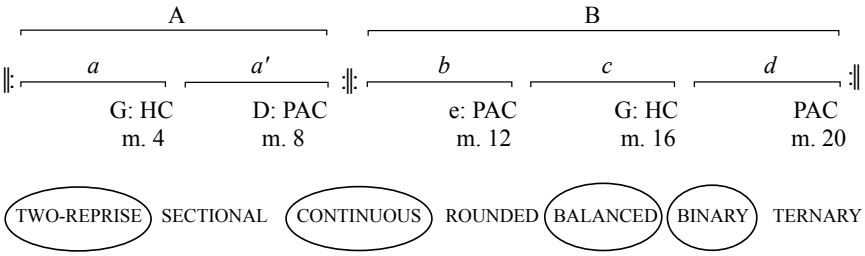


23.4.5.

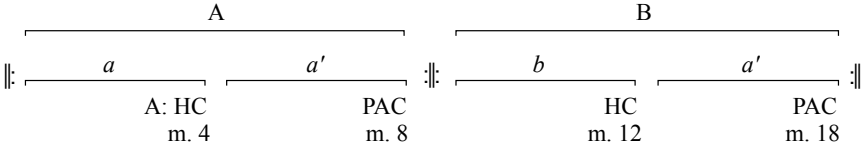


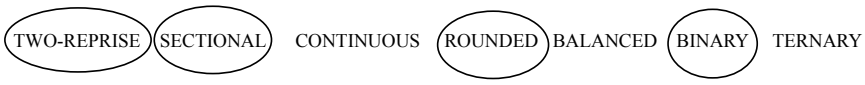
24 · Binary and Ternary Forms
24.9 · Practice Exercises

24.9.1.

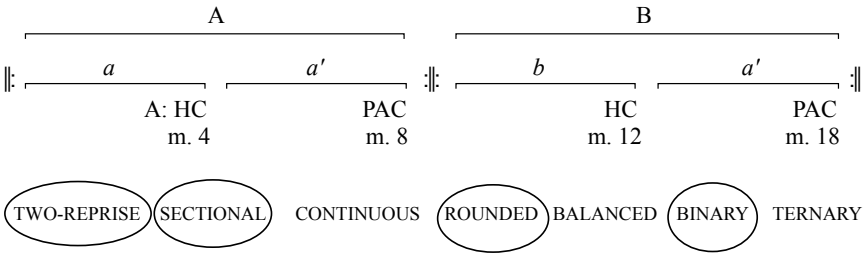


24.9.2.

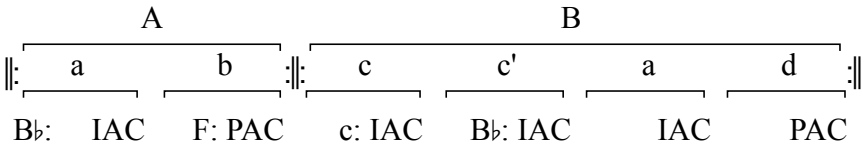




24.9.3.

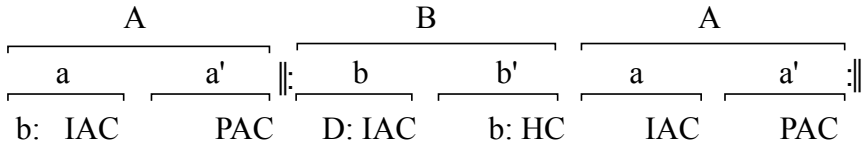


24.9.4.



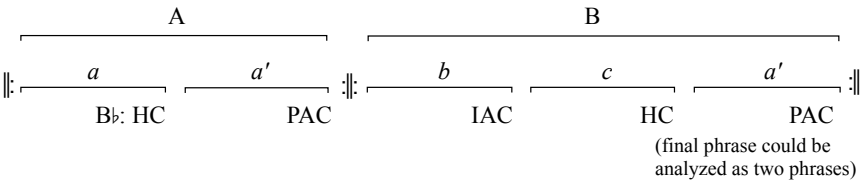
Two-Reprise Continuous Ternary, if looking at the proportion, or Two-Reprise Continuous Rounded Binary, if you interpret the first two notes in bar 13 as being built from the first two notes in bar 1—and if you are considering that Mozart, as a Classical-era composer, is likely to compose a rounded binary. Two-Reprise Continuous Balanced Binary is a label that describes that the endings of the halves are the same, but doesn't take into account the return of the opening material in bar 21.

24.9.5.



Sectional Ternary

24.9.6.



Two-Reprise Sectional Rounded Binary (because the motives from the first section are used in the construction of the melody of the second section)

25 · Sonata and Rondo Forms
25.6 · Practice Exercises

25.6.1.

(a) Haydn: Expository

(b) Beethoven: Developmental

(c) Mozart K. 576: Transitional

(d) Mozart K. 550: Developmental

(e) Mozart K. 309: Expository

(f) Haydn: Terminative

(g) Mozart K. 309: Transitional

(h) Mozart K. 576: Terminative

(i) Mozart K. 310: Terminative

(j) Haydn: Transitional

(k) Mozart K. 457: Expository

(l) Mozart K. 550, IV: Developmental

25.6.2.

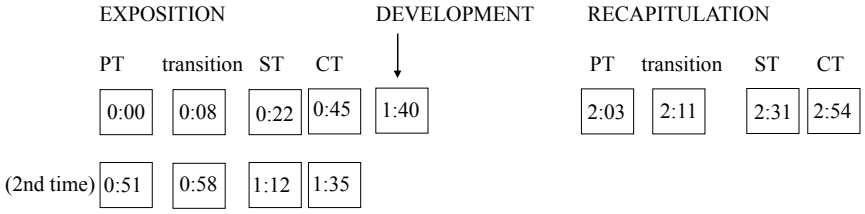


Figure A.0.1 Mozart, Piano Sonata K. 545, I.

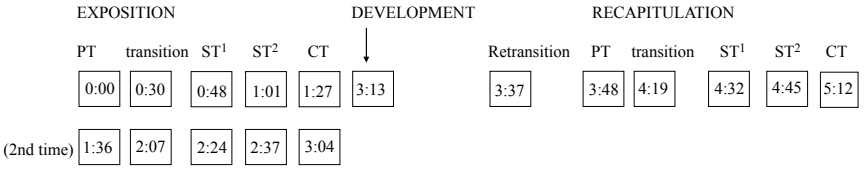
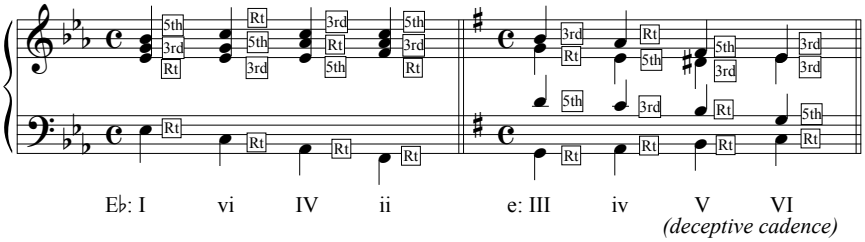


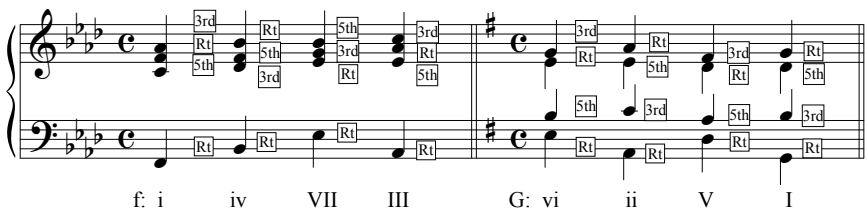
Figure A.0.2 Mozart, *Eine kleine nachtmusik*, K. 525, I.

26 · Voice Leading Triads
26.13 · Practice Exercises

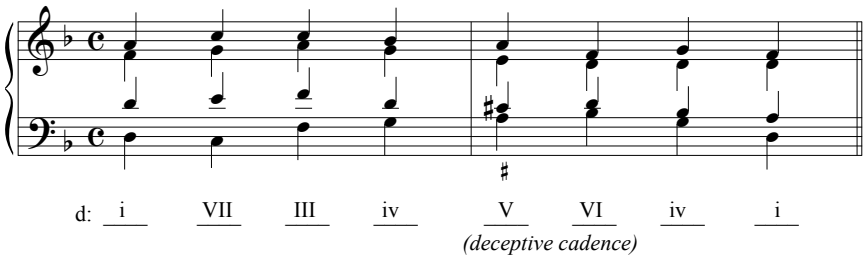
26.13.1.



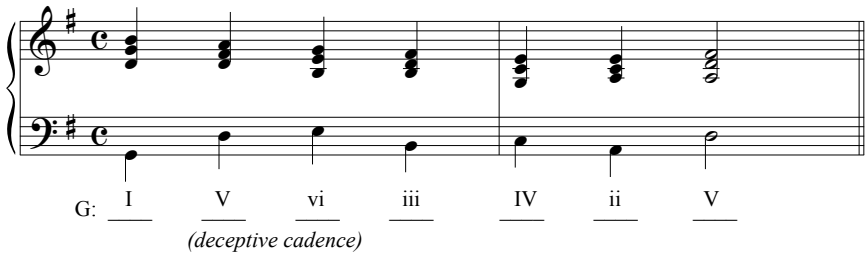
26.13.2.



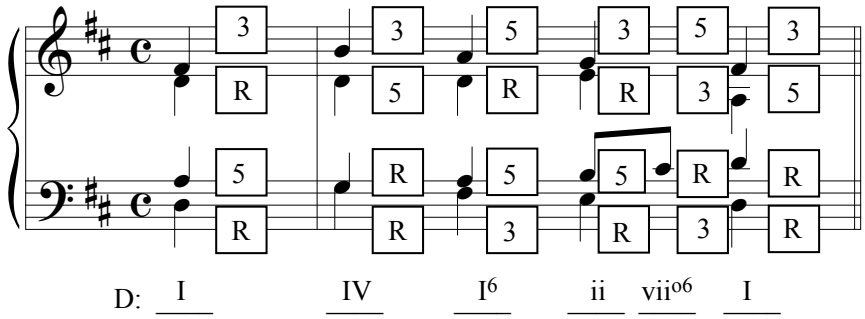
26.13.3.



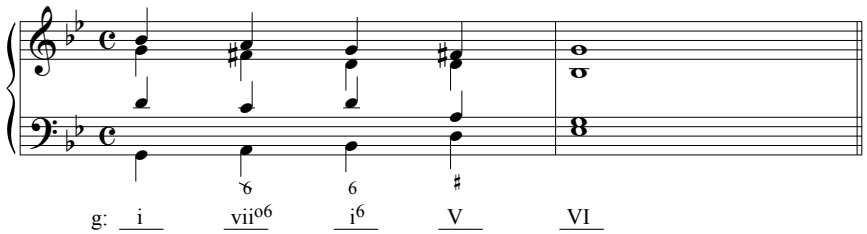
26.13.4.



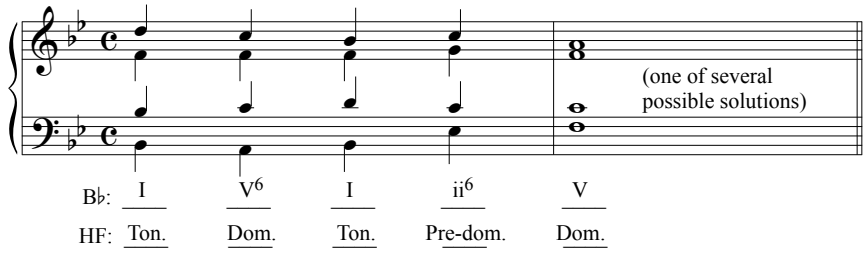
26.13.5.



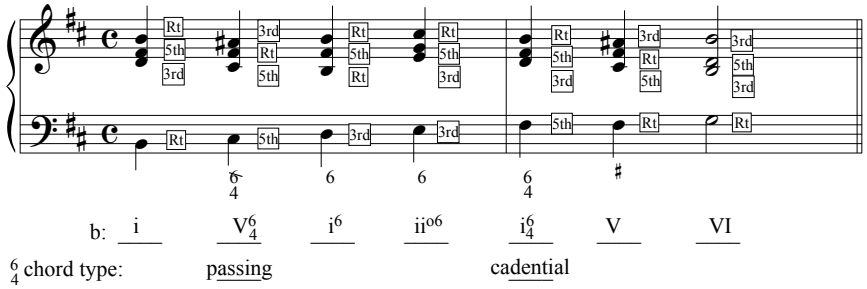
26.13.6.



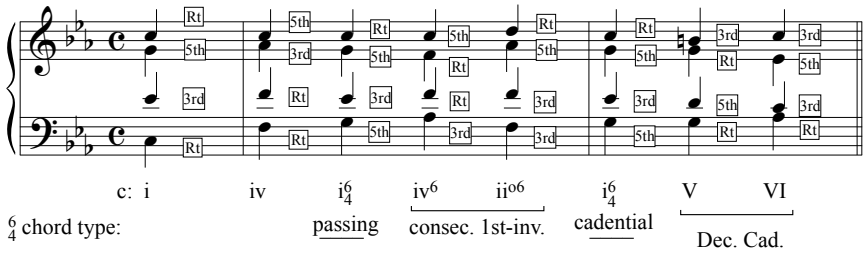
26.13.7.



26.13.8.



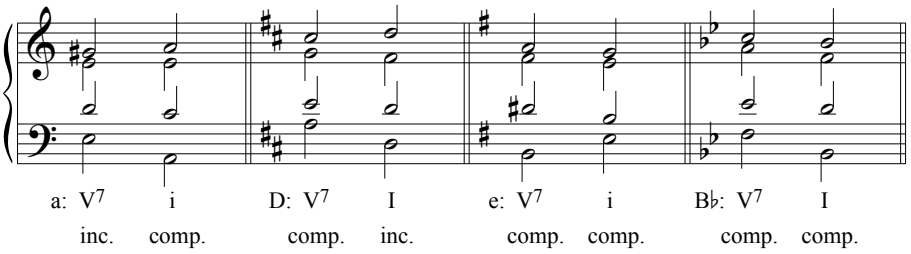
26.13.9.



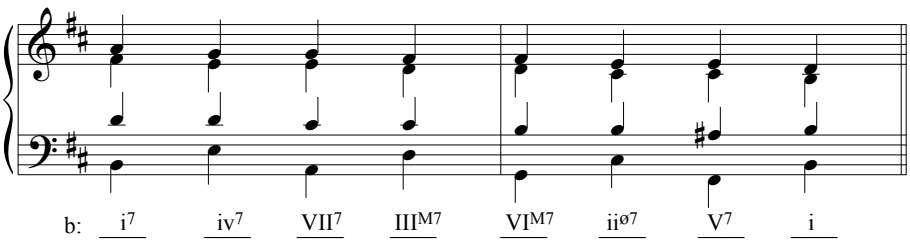
27 · Voice Leading Seventh Chords

27.6 · Practice Exercises

27.6.1.

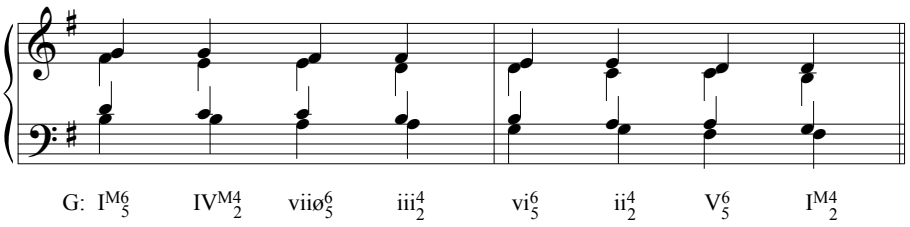


27.6.2.



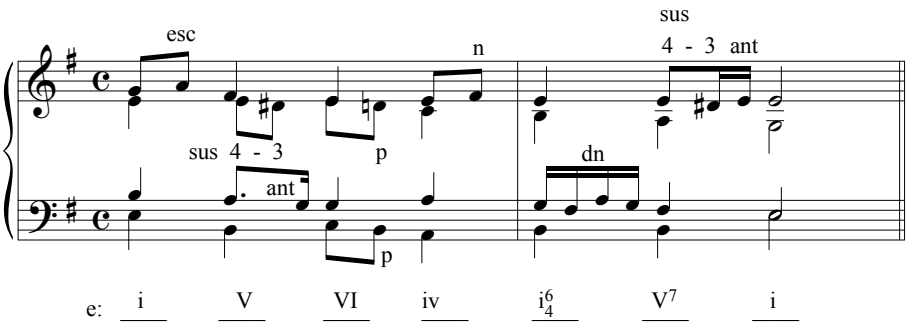
(alternate complete with incomplete, or incomplete with complete)

27.6.3.

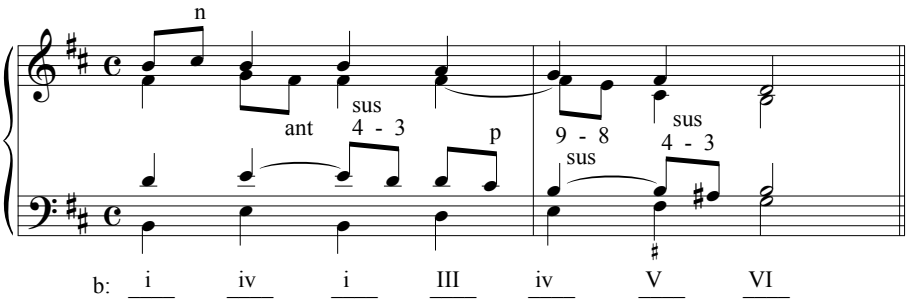


28 · Voice Leading With Non-Chord Tones
28.4 · Practice Exercises

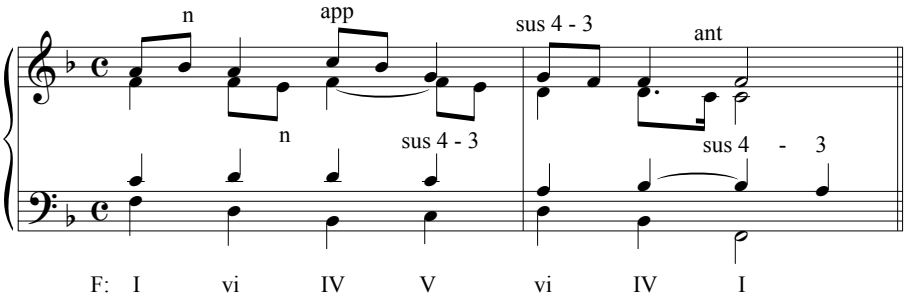
28.4.1.



28.4.2.

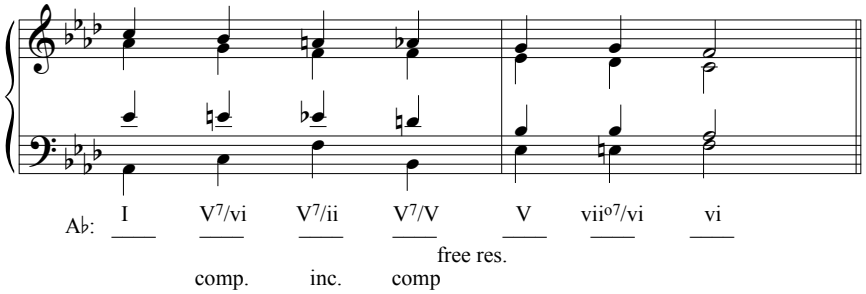


28.4.3.

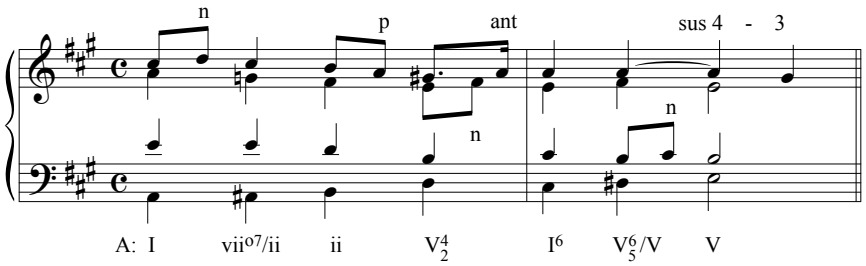


29 · Voice Leading Chromatic Harmonies
29.5 · Practice Exercises

29.5.1.

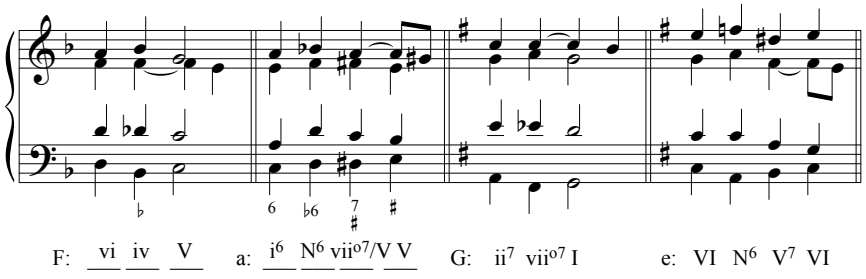


29.5.2.

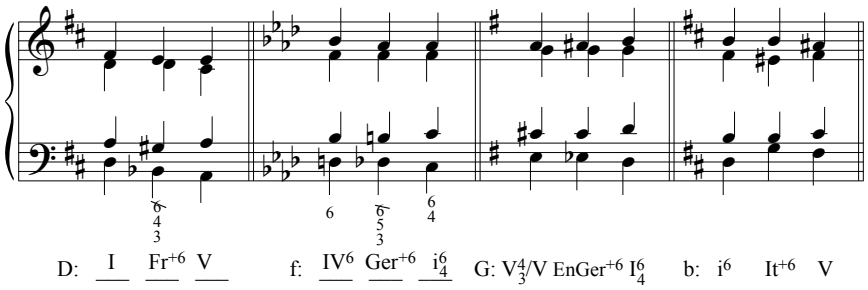


Notice that the chords on beats 5 and 6 are consecutive first inversion chords (even though one is a 7th chord), therefore the third is doubled on I^6 to avoid parallel fifths.

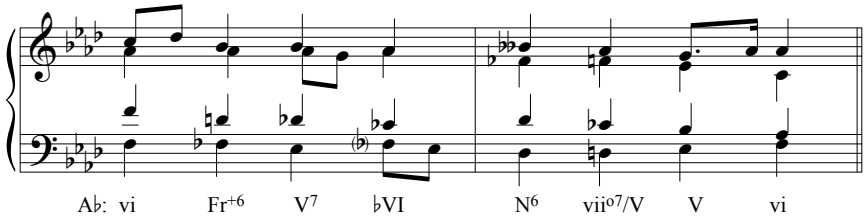
29.5.3.



29.5.4.



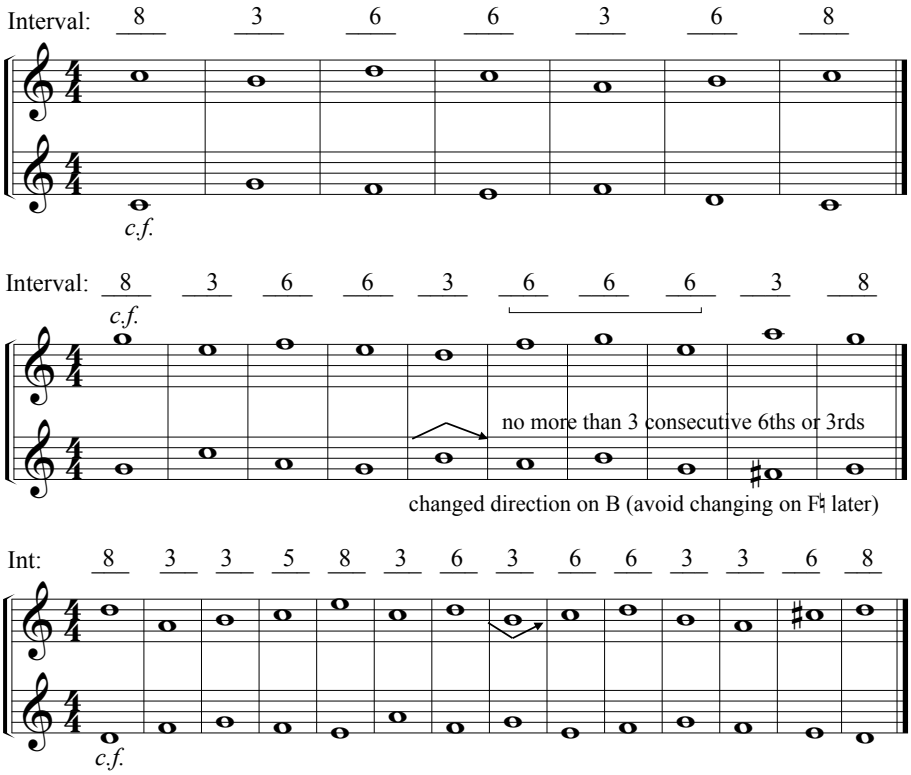
29.5.5.

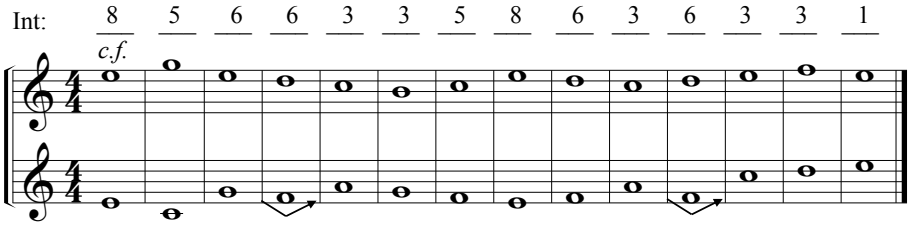


30 · Introduction to Counterpoint
30.9 · Practice Exercises

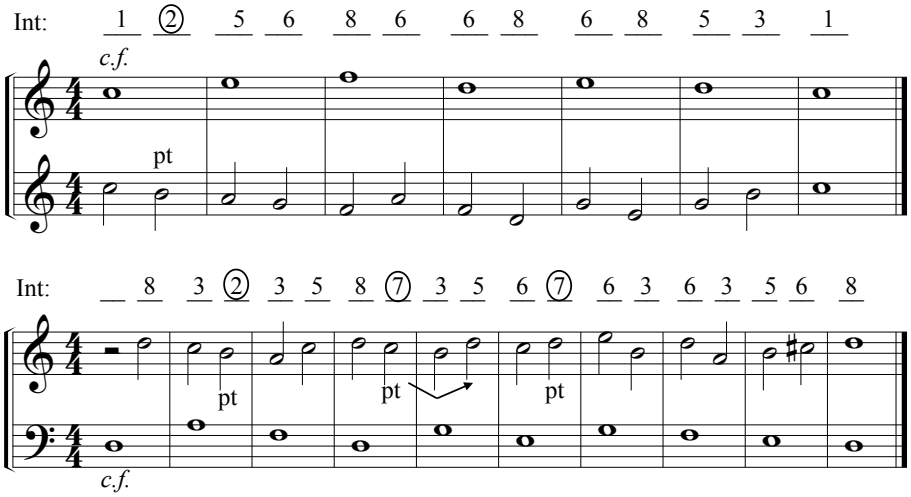
First and Second Species Exercises

30.9.1.



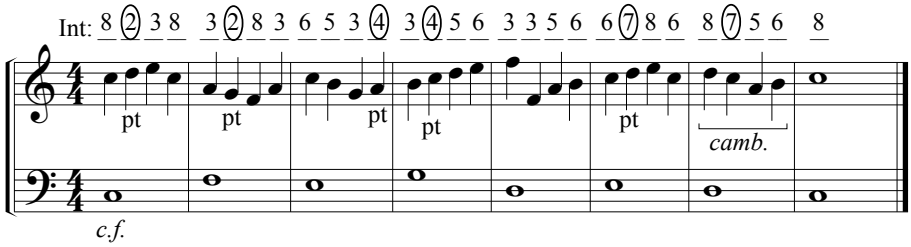


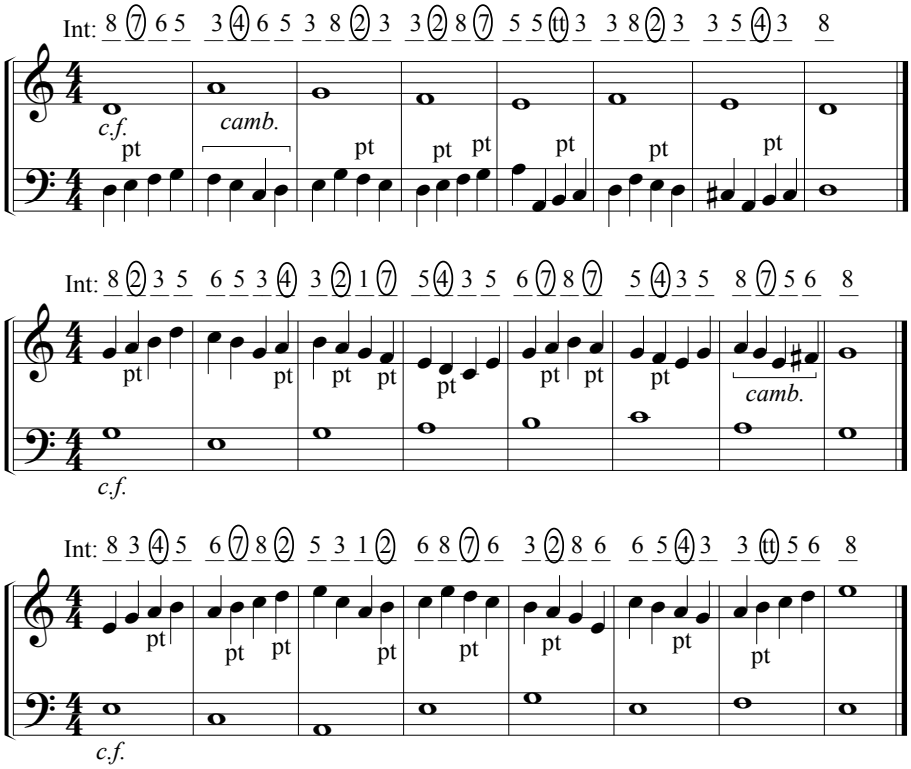
30.9.2.



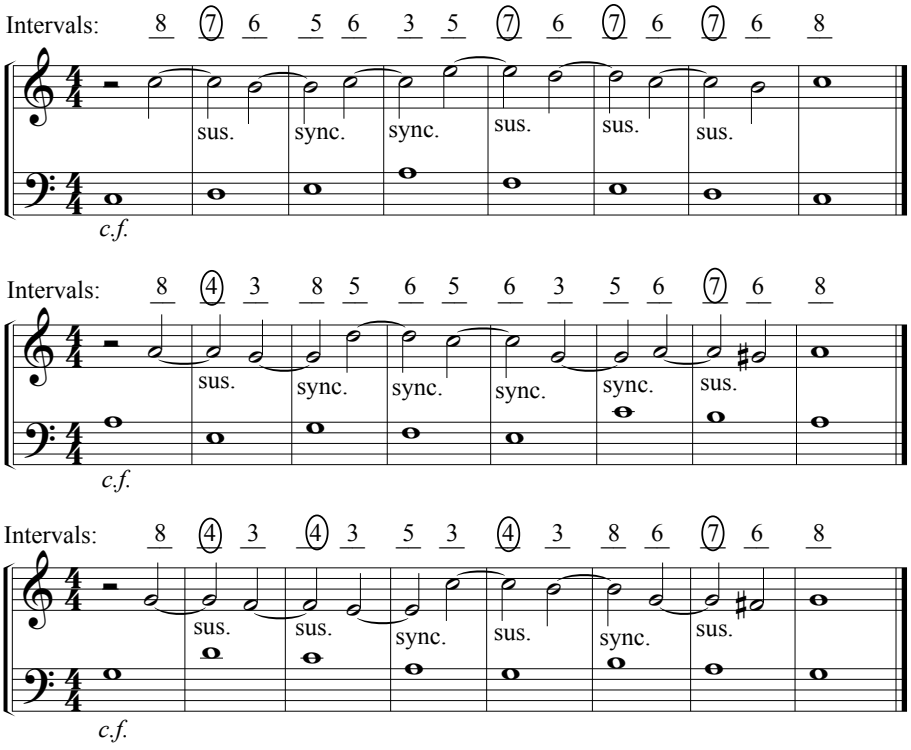
Species Counterpoint: Day Two

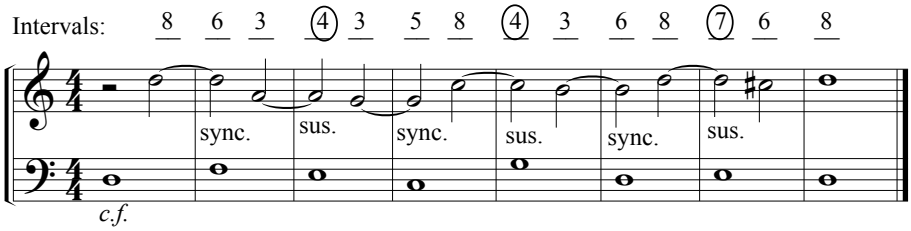
30.9.3.




Int: 8 7 6 5 3 4 6 5 3 8 2 3 3 2 8 7 5 5 tt 3 3 8 2 3 3 5 4 3 8
c.f.
camb.
pt
Int: 8 2 3 5 6 5 3 4 3 2 1 7 5 4 3 5 6 7 8 7 5 4 3 5 8 7 5 6 8
camb.
c.f.
Int: 8 3 4 5 6 7 8 2 5 3 1 2 6 8 7 6 3 2 8 6 6 5 4 3 3 tt 5 6 8
c.f.

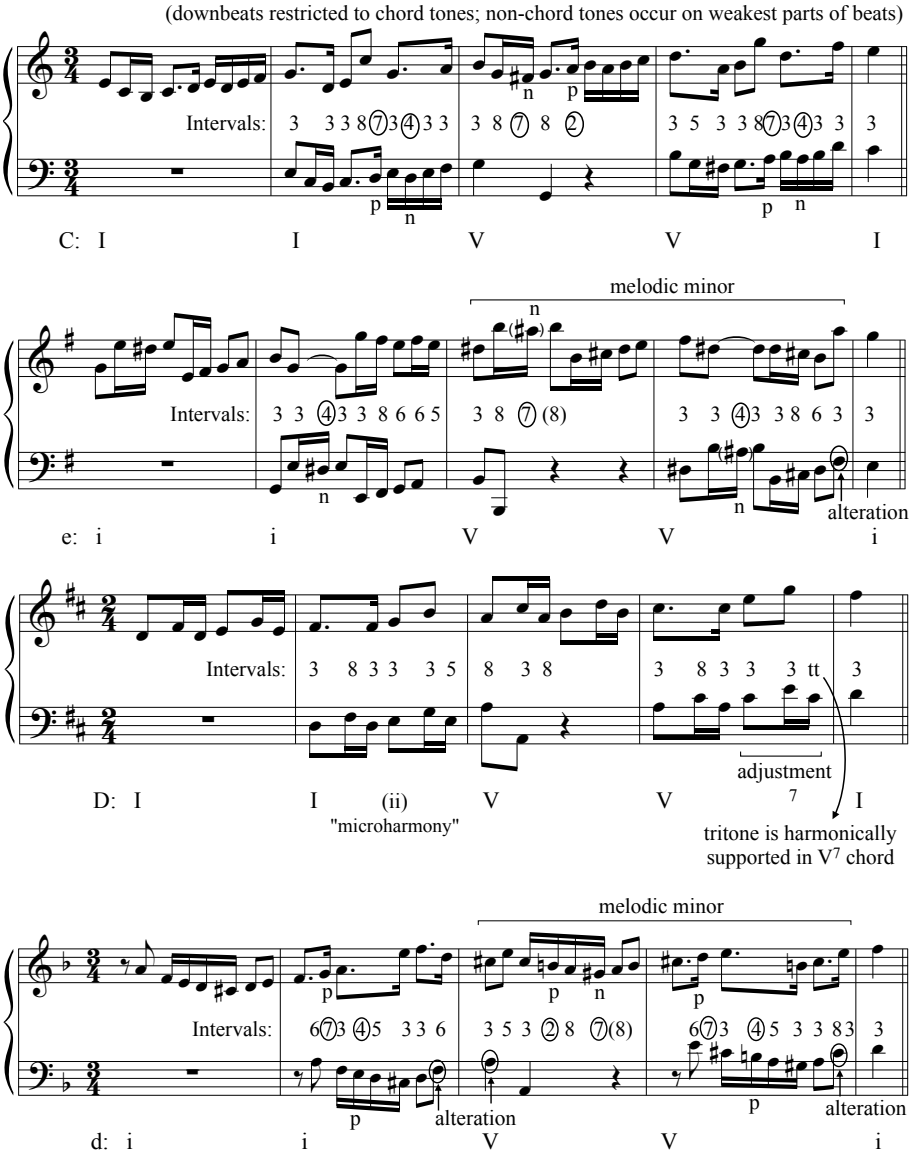
30.9.4.


Intervals: 8 7 6 5 6 3 5 7 6 7 6 7 6 8
sus.
sync.
c.f.
Intervals: 8 4 3 8 5 6 5 6 3 5 6 7 6 8
Intervals: 8 4 3 4 3 5 3 4 3 8 6 7 6 8



Invention Expositions

30.9.5.



Fugue Analysis

30.9.6.

Table A.0.3 ***Mass in B Minor*****: Fugue Analysis Table**

FORM	Exposition 1			
SOPRANO				
ALTO				
TENOR			Subject	
BASS	Subject	Subject	Sub.	Countersubject
KEY	F♯m		C♯m	
Meas.	1	2	3	4

FORM		(Bridge)		
SOPRANO				
ALTO				
TENOR	Subject	Bridge Mot. A	Bridge Mot. A	Bridge Mot. A
BASS	Countersubject	Bridge Mot. B	Bridge Mot. B	Bridge Mot. B
KEY				
Meas.	5	6	7	8

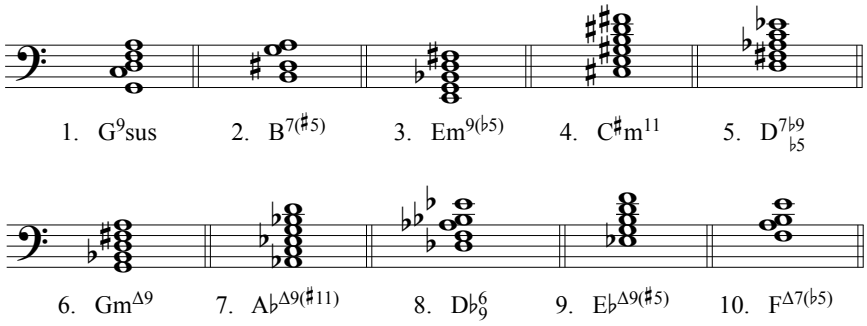
FORM	Exposition 1 (continues until 4th voice has subject)			
SOPRANO			Subject	
ALTO	Subject	Subject	Sub.	Countersubject
TENOR	Countersubject	Countersubject	C.S.	Ctrpt
BASS	Ctrpt	Ctrpt	Ctrpt	Ctrpt
KEY	F♯m		C♯m	
Meas.	9	10	11	12

FORM		Episode 1		
SOPRANO	Subject	Bridge Mot. A	Bridge Mot. A	
ALTO	Countersubject	Bridge Mot. B	Mot. B Ctrpt	Ctrpt
TENOR	Ctrpt	Ctrpt	Ctrpt	Ctrpt
BASS	Ctrpt			
KEY				
Meas.	13	14	15	16

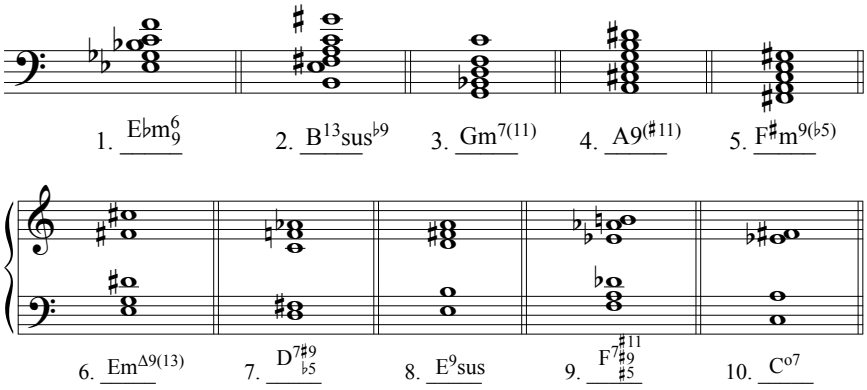
FORM		Exposition 2		
SOPRANO	Cadential	Ctrpt	Ctrpt	Ctrpt
ALTO	Cadential	Subject	Subject	Subject
TENOR	Cadential	Ctrpt	Ctrpt	Ctrpt
BASS				
KEY	___	F♯m		
Meas.	17	18	19	20

31 · Introduction to Jazz Theory
31.12 · Practice Exercises

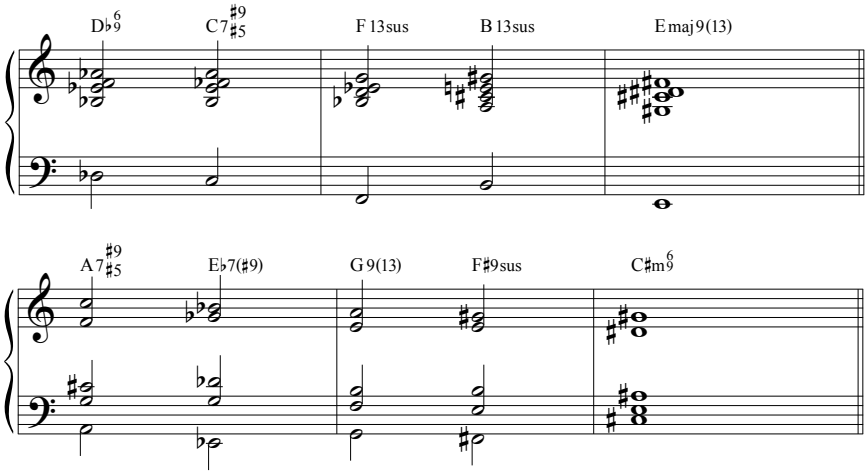
31.12.1.



31.12.2.

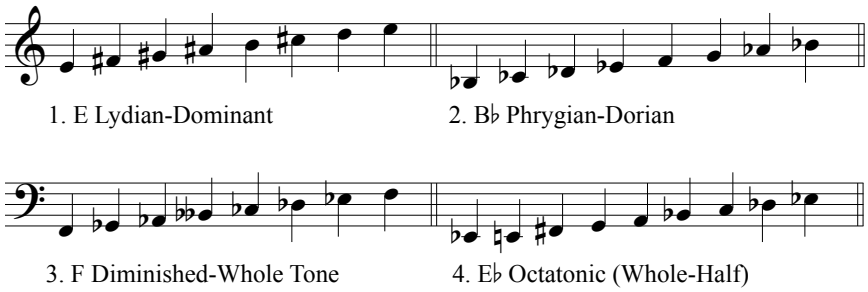


31.12.3.

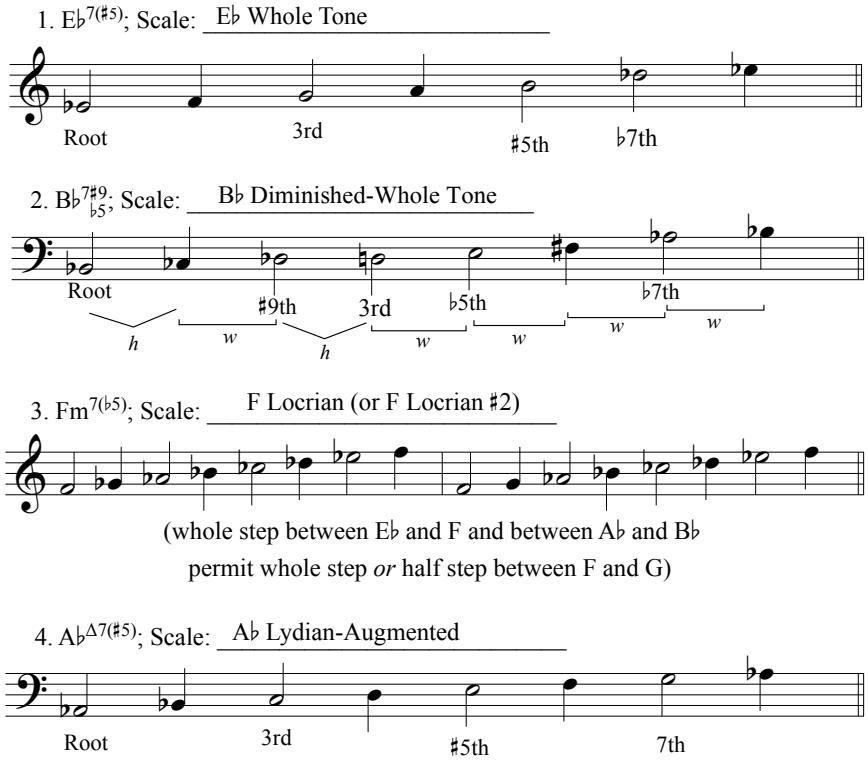


31.12.4. 1. G♯ Diminished-Whole Tone
2. F♯ Octatonic (Half-Whole)
3. F Locrian ♯2
4. C Whole-Tone
5. A♭ Lydian-Dominant
6. C Locrian

31.12.5.



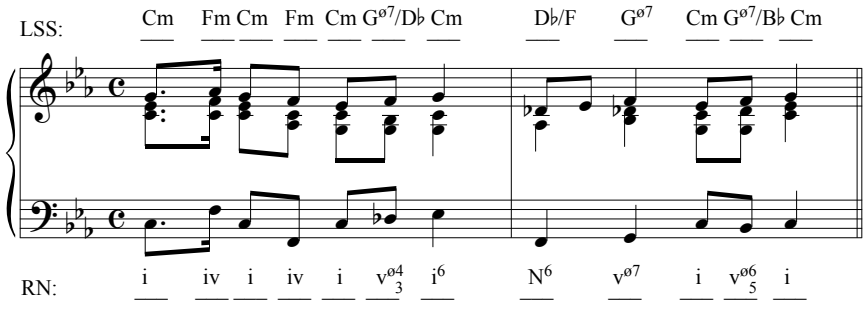
31.12.6.



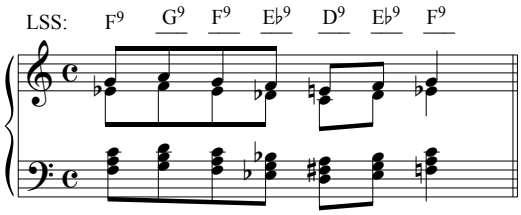
32 · Impressionism and Extended Tonality

32.5 · Practice Exercises

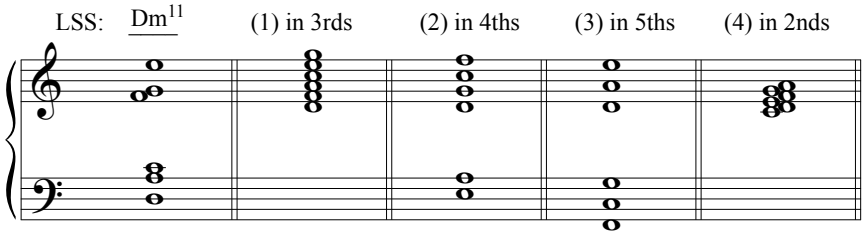
32.5.1.



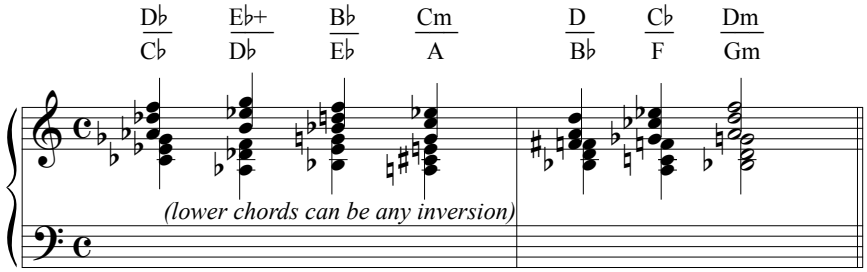
32.5.2.



32.5.3.



32.5.4.



33 · Set Theory

33.9 · Practice Exercises

33.9.1.

(a) Normal form is [0, 2, 7]. Prime form is (027).

(b) Normal form is [1, 3, 6, 8]. Prime form is (0257).

(c) Normal form is [6, 10, 11, 1]. Prime form is (0237).

(d) Normal form is [7, 8, 0, 3]. Prime form is (0158).

(e) Normal form is [11, 0, 1, 4, 6]. Prime form is (01257).

(f) Normal form is [6, 7, 10, 11, 2]. Prime form is (01458).

(g) Normal form is [9, 10, 0, 1, 4, 6]. Prime form is (013479).

33.9.2.

Table A.0.4

Set	Normal Form	Prime Form	Forte Number	Interval Vector
1	[11, 1, 3, 5, 6]	(01357)	5–24	131221
2	[5, 8, 10, 0]	(0247)	4–22	021120
3	[9, 0, 1, 4, 5]	(01458)	5–21	202420
4	[3, 5, 6, 10]	(0237)	4–14	111120
5	[2, 3, 6, 7, 9, 10]	(013478)	6–Z19	313431
6	[2, 3, 5, 6, 9, 10]	(013478)	6–Z19	313431

33.9.3.

(a) [5, 8, 9]

(b) [9, 11, 3, 4]

(c) [10, 11, 1, 4, 5]

33.9.4.

(a) [1, 2, 5]

(b) [0, 2, 4]

(c) [10, 11, 3, 5]

33.9.5.

(a) $T_{10}I$

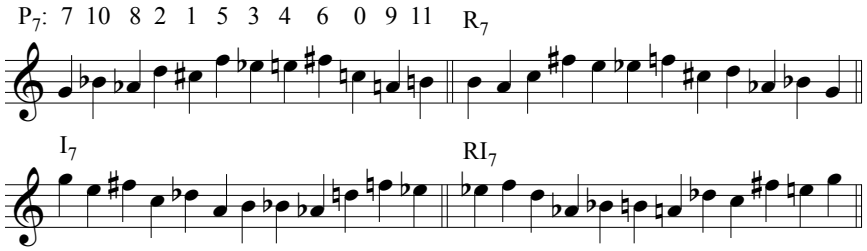
(b) $T_{11}I$

(c) T_5I

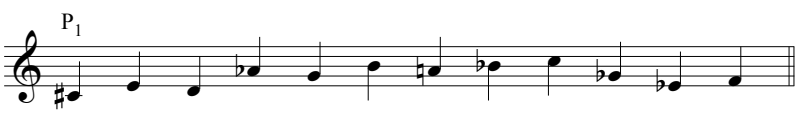
34 · Serialism

34.7 · Practice Exercises

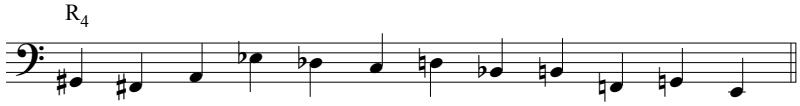
34.7.1.



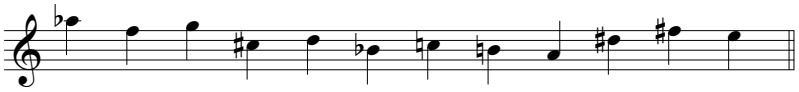
(a)



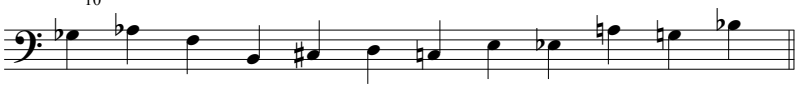
(b)



(c) I_8



(d) RI_{10}



34.7.2.

(a) RI_{10}

(b) I_1

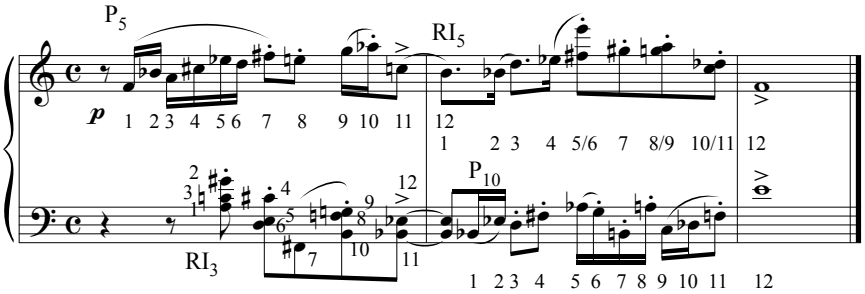
(c) R_5

34.7.3.

Table A.0.5 Twelve-Tone Matrix

	$I_3\downarrow$	$I_7\downarrow$	$I_{11}\downarrow$	$I_1\downarrow$	$I_5\downarrow$	$I_0\downarrow$	$I_2\downarrow$	$I_{10}\downarrow$	$I_6\downarrow$	$I_4\downarrow$	$I_8\downarrow$	$I_9\downarrow$	
$P_3\rightarrow$	E♭	G	B	C♯	F	C	D	B♭	G♭	E	G♯	A	←I
$P_{11}\rightarrow$	B	D♯	G	A	C♯	G♯	A♯	F♯	D	C	E	F	←F
$P_7\rightarrow$	G	B	D♯	F	A	E	F♯	D	B♭	A♭	C	D♭	←I
$P_5\rightarrow$	F	A	C♯	E♭	G	D	E	C	A♭	G♭	B♭	B	←I
$P_1\rightarrow$	D♭	F	A	B	E♭	B♭	C	A♭	E	D	G♭	G	←I
$P_6\rightarrow$	G♭	B♭	D	E	A♭	E♭	F	D♭	A	G	B	C	←I
$P_4\rightarrow$	E	G♯	C	D	G♭	D♭	E♭	B	G	F	A	B♭	←I
$P_8\rightarrow$	A♭	C	E	G♭	B♭	F	G	E♭	B	A	D♭	D	←I
$P_0\rightarrow$	C	E	A♭	B♭	D	A	B	G	E♭	D♭	F	G♭	←I
$P_2\rightarrow$	D	F♯	A♯	C	E	B	D♭	A	F	E♭	G	A♭	←I
$P_{10}\rightarrow$	B♭	D	G♭	A♭	C	G	A	F	D♭	B	D♯	E	←F
$P_9\rightarrow$	A	C♯	F	G	B	F♯	A♭	E	C	B♭	D	E♭	←I
	$\uparrow RI_3$	$\uparrow RI_7$	$\uparrow RI_{11}$	$\uparrow RI_1$	$\uparrow RI_5$	$\uparrow RI_0$	$\uparrow RI_2$	$\uparrow RI_{10}$	$\uparrow RI_6$	$\uparrow RI_4$	$\uparrow RI_8$	$\uparrow RI_9$	

34.7.4.



34.7.5.

(a) Set 1: 3, 7, 11. Normal form: [3, 7, 11] Prime form: (048) Interval vector: 000300

(b) Set 2: 1, 5, 0. Normal form: [0, 1, 5] Prime form: (015) Interval vector: 100110

(c) Set 3: 2, 10, 6. Normal form: [2, 6, 10] Prime form: (048) Interval vector: 000300

(d) Set 4: 4, 8, 9. Normal form: [4, 8, 9] Prime form: (015) Interval vector: 100110

Appendix B

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