Homework 2
Math 109 / Music 109A, Spring 2010

Due Monday, February 15.

1. In $\frac{3}{2}$ time, give the duration in beats for:
   (a) a dotted sixteenth note
   (b) a quarter note with four dots

   In $\frac{12}{8}$ time, taken as a compound time signature, give the duration in beats for:
   (c) a dotted half note
   (d) an eighth note tied to a thirty-second note

2. From the following measure derive three subsequent measures having the same rhythm,
   \[ \begin{aligned}
   \text{G} & \text{2} \text{2} \text{2} \text{2} \\
   \text{4} & \text{4} \\
   \text{9} & \text{9} \\
   \text{2} & \text{2} \text{2} \text{2} \text{2} \\
   \text{4} & \text{4} \\
   \end{aligned} \]

   by using the following transformations, respectively, based on the first measure:
   (a) diatonic transposition up one scale tone
   (b) diatonic transposition up three scale tones
   (c) chromatic transposition up a minor third

   Which of these, if any, represent both diatonic and chromatic transposition?
3. Prove the equation:

\[ 1 + r + r^2 + \cdots + r^m = \frac{1 - r^{m+1}}{1 - r}. \]

for any integer \( m \geq 0 \) and any real number \( r \neq 1 \). **Hint:** Consider the product \((1 - r)(1 + r + r^2 + \cdots + r^m)\). Explain how this relates to the durations of dotted notes.

4. Notate and name the following tuplets:

(a) that which divides the half note into 5 equal notes

(b) that which divides the eighth note into 7 equal notes

(c) that which divides the whole note into 11 equal notes

Notate and give the total duration, in \( \frac{4}{4} \) time, of:

(a) a sixteenth note quintuplet

(b) a half note triplet

5. Complete these measures with a single durational note:

(a) | \( \boxed{\text{\frac{3}{4} \frac{1}{4} \frac{1}{4} \frac{1}{4}} \text{}} \) | (b) | \( \boxed{\text{\frac{4}{4} \frac{1}{4} \frac{1}{4} \frac{1}{4} \frac{1}{4}} \text{}} \) | (c) | \( \boxed{\text{\frac{9}{8} \frac{1}{4} \frac{1}{4} \frac{1}{4} \frac{1}{4}} \text{}} \) |
6. For the refrain of the song *The Man I Love*, by George Gershwin and Ira Gershwin, give the form (e.g., ABAC or ABA) by dividing the refrain into segments consisting of eight measures.

For the same refrain, locate transformations such as translation (melodic and/or rhythmic) and transposition (diatonic and/or chromatic), other than those that are dictated by the global form determined above.

The song is in the book *Music By Gershwin*, which is on the shelf in Room 117. You may reference your discussion by numbering the measures, letting measure 1 be the first measure of the refrain.

7. Identify these chords by root note and suffix (e.g., Gm$^7$ or B$^b$ aug). In the case of augmented or diminished seventh chords, take the root to be the lowest note.

(a) \[
\text{major}
\]
(b) \[
\text{minor}
\]
(c) \[
\text{major}
\]
(d) \[
\text{Lydian}
\]

Identify these chords by root scale note and suffix (e.g., III$^7$ or $\#IV$ m) relative to the indicated mode. Again, in the case of augmented or diminished seventh chords, take the root to be the lowest note.
8. Write these chords with correct spelling on the bass clef below.

(a) E♭m7  (b) D dim  (c) G♭  (d) C♯7

9. Write these chords with correct spelling on the given clef, using the indicated key signature and mode.

(a) ♭III7 in the key of C major

(b) IVm7 in the key of B♭ minor

(c) I aug in the key of A Myxolydian

(d) ♭VII in the key of A♭ major

10. Name the chord given by each of these sequence of semitones:

(a) 4,5  (b) 2,4,3  (c) 6,3,6  (d) 7,8,7  (e) 16,6,9,5,7

Name the chord given by each of these sequence of intervals:

(a) fifth, fourth, major third, tritone

(b) major third, minor sixth, major sixth

(c) fifth, octave, minor third, tritone

(d) step, fifth, major sixth

(e) minor third, minor third, step