Homework 2
Math 109 / Music 109A, Spring 2015

Due Monday, February 9.

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

In \(\frac{9}{8}\) time, taken as a compound time signature, give the duration in beats for:
   (d) a quarter note
   (e) an eighth note tied to a thirty-second note

2. 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 \(r \neq 1\). \textbf{Hint}: Consider the product \((1 - r)(1 + r + r^2 + \cdots + r^m)\). Explain how this relates to the durations of dotted notes.

3. Notate and name the following tuplets:
   (a) that which divides the whole note into 3 equal notes
   (b) that which divides the half note into 7 equal notes
   (c) that which divides the quarter note into 13 equal notes

Notate and give the total duration, in \(\frac{4}{4}\) time, of:
   (d) a sixteenth note quintuplet
   (e) an eighth note triplet
4. Complete these measures with a single durational note:

(a) \[ \text{\(\frac{3}{4}\)} \]

(b) \[ \text{\(\frac{4}{4}\)} \]

(c) \[ \text{\(\frac{9}{8}\)} \]

5. Complete the following example three ways with a measure having the same rhythm,

\[
\begin{array}{cccccccccccc}
\text{\(\frac{3}{4}\)} & \text{\(\frac{4}{4}\)} & \text{\(\frac{9}{8}\)} & \text{\(\frac{9}{8}\)} & \text{\(\frac{3}{4}\)} & \text{\(\frac{4}{4}\)} & \text{\(\frac{9}{8}\)} & \text{\(\frac{9}{8}\)} & \text{\(\frac{3}{4}\)} & \text{\(\frac{4}{4}\)} & \text{\(\frac{9}{8}\)} & \text{\(\frac{9}{8}\)}
\end{array}
\]

employing, respectively:

(a) diatonic transposition up three scale tones

(b) diatonic transposition down one scale tone

(c) chromatic transposition one step (two semitones)

Which of these, if any, represent both diatonic and chromatic transposition?

6. For the refrain of the song *Somebody Loves Me*, music by George Gershwin, give the form (e.g., ABA'C 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 in (9).

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., Gm7 or B♭aug). In the case of augmented or diminished seventh chords, take the root to be the lowest note.

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

Identify these chords by root scale note and suffix (e.g., III7 or ♯IVm) relative to the indicated mode. Again, in the case of augmented or diminished seventh chords, take the root to be the lowest note.

(e) \[ \text{major} \]
(f) \[ \text{minor} \]
(g) \[ \text{major} \]
(h) \[ \text{Lydian} \]

8. Write these chords with correct spelling on the bass clef.

(a) F♯m7  (b) G aug  (c) D♯  (d) C♯7
9. Write these chords with correct spelling on the given clef, using the indicated key signature and mode. Notate the correct key signature on the clef.

(a) ♭VI\(^7\) in the key of C major

(b) Vm\(^7\) in the key of B\(^\natural\) minor

(c) II dim in the key of F Myxolydian

(d) ♯III in the key of D Dorian

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

(a) 3, 4  
(b) 2, 3, 4  
(c) 6, 3, 6  
(d) 7, 8, 7  
(e) 8, 16, 27

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

(a) fifth, fourth, minor third, fifth

(b) major third, minor sixth, fifth

(c) fifth, octave, minor third, tritone

(d) step, fifth, major sixth

(e) minor third, step, major third