Homework 2
Math 109 / Music 109A, Spring 2004

Due Monday, February 16.

(1) In $\frac{3}{4}$ time, give the duration in beats for:
   (a) a dotted sixty-fourth note
   (b) a half note with four dots

In $\frac{12}{8}$ time, taken as a compound time signature, give the duration in beats for:
   (a) a dotted quarter note
   (b) a quarter 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 $r \neq 1$. 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 half note into 7 equal notes
   (b) that which divides the sixteenth note into 5 equal notes

Notate and give the total duration of:
   (a) a sixteenth note septuplet
   (b) a quarter note triplet

(4) Complete these measures with a single durational note:

(a) $\frac{3}{4}$ \hspace{1cm} (b) $\frac{4}{4}$ \hspace{1cm} (c) $\frac{8}{8}$
(5) Complete the following excerpt three ways with a measure having the same rhythm,

\[ \text{\includegraphics[width=0.5\textwidth]{music_staff}} \]

employing, respectively:

(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?

(6) Compose a melody with percussion accompaniment which exhibits the following features:

(a) Some symmetry in its overall form (e.g. ABAC or ABA)

(b) Some usage of one or more of these transformations:

(i) translation (melodic or rhythmic)

(ii) transposition (diatonic or chromatic)

(iii) retrogression

This should be submitted electronically as an mp3 file. It should be accompanied by the musical score (You may print out the Finale file.) and a short essay which identifies its overall form and the transformations uses.