Homework 3
Math 109 / Music 109A, Spring 2004

Due Monday, March 1.

(1) Identify these chords by root note and suffix (e.g., Gm7 or Bb aug). In the case of augmented or diminished seventh chords, take the root to be the lowest note.

(a) \[ \text{\includegraphics{image1}} \]
(b) \[ \text{\includegraphics{image2}} \]
(c) \[ \text{\includegraphics{image3}} \]
(d) \[ \text{\includegraphics{image4}} \]

Identify these chords by root scale note and suffix (e.g., III7 or 7IV m) relative to the indicated mode. Again, in the case of augmented or diminished seventh chords, take the root to be the lowest note.

(e) \[ \text{\includegraphics{image5}} \] major
(f) \[ \text{\includegraphics{image6}} \] minor
(g) \[ \text{\includegraphics{image7}} \] major
(h) \[ \text{\includegraphics{image8}} \] Lydian

(2) Write these chords with correct spelling on the bass clef.

(a) Em7 \hspace{1cm} (b) D#dim \hspace{1cm} (c) A♭ \hspace{1cm} (d) C♯7

(3) Write these chords with correct spelling on the bass clef, using the indicated key signature and mode.

(a) bII7 in the key of C major
(b) IVm7 in the key of B♭ minor
(c) Iaug in the key of F Myxolydian
(d) bVII in the key of E♭ major

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(4) For each of the seven types of chords discussed in the text, list by Roman numeral all the ways the chord can be created using only diatonic notes.

(5) Consider the four-note chord obtained by taking the seventh chord and flattening its fifth. Such a chord is sometimes labeled with the suffix $7-5$. Write the sequence of semitones $(a, b, c, d)$ which define the chord and use this sequence to explain why this chord does not have a unique root. How many possible roots does it have? Write an example of such a chord on some clef and give all possible labelings of it by root note class.

(6) Express each of these intervals as elements of $\mathbb{R}^+$ three ways: (1) as a radical or the reciprocal of a radical, (2) as a power of 2, and (3) by a decimal approximation with 3 decimal digits.

(a) up 67 cents
(b) down 1050 cents
(c) up a major sixth
(d) the interval from $B_3$ to $C_4$

(7) Assuming $A_4$ is tuned to 440 Hz, find the frequencies for:

(a) $C_4$  (b) $D_2^4$  (c) $F_3$  (d) $E_1^\flat$

Suppose middle C is tuned as 256 Hz. Find the frequencies for:

(a) $A_4$  (b) $G_6^\flat$  (c) $C_1$  (d) $F_2^\sharp$

(8) For each of these chords, voiced within an octave with the root on the bottom, give the pitch of each note in the chord. Assume $A_4$ is tuned to 440 Hz.

(a) major triad with root $E_3$

(b) minor triad with root $F_4^\flat$

(c) minor seventh chord with root $A_5$

(d) diminished seventh with root $A_3^\flat$

(9) Determine whether each pair of musical intervals, expressed as elements of $\mathbb{R}^+$, are equivalent modulo octave. Explain why or why not.

(a) 5, 20  (b) 14, $\frac{7}{2}$  (c) 2.3, 9.2  (d) 1.04, 0.13  (e) $\pi$, $\frac{3\pi}{2}$

(10) Suppose a string on a banjo has length 40cm. Indicate positions of the 12 frets which will allow the string to play one octave of the ascending chromatic scale.