EXAM II
Math 109 / Music 109A, Spring 2005

Name ___________________________ Id _______________________

Each problem is worth 10 points. For all answers given as decimal approximations, round of to two digits to the right of the decimal.

(1) Express each of these musical 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.

(a) up 27 cents

(b) up a minor third

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

(a) $A_2$

(b) $G_2^\#$

(3) A string on a stringed instrument has length 50 cm. Indicate the position of the single fret which will allow the string to play the note a tritone above the original pitch.

(4) In a given mode, the tonic triad is the chord consisting of scale tones $\hat{1}$, $\hat{3}$, and $\hat{5}$. For the following modes, classify the tonic triad as major, minor, diminished, or augmented.

(a) Myxolydian

(b) Locrian
(5) Identify each chord in this major mode (Ionian) passage. Above the staff label each chord by root note class with suffix (e.g., $E^7$). Below the staff, label each chord by root scale tone (e.g. $b\text{III}^7$).

(6) Write these chords in root position in the given key signature, major mode, with correct spelling.

(a) $\text{IV}^7$

(b) $\text{II}m^7$

(7) Complete the following to a four-part harmonization of the given melody (key of C major) using only whole notes, so that the melody is the top part and the bottom note is always the root. The chords should be the those indicated under the staff.
(8) Find the value $\alpha$ for which the pitch associated to the periodic function $y = \sin(\alpha t)$, where $t$ is time in seconds, is $D_4^2$.

(9) Find the period, frequency, amplitude, and phase shift for the function

$$f(t) = 2 \sin(400\pi t + \frac{\pi}{4})$$

and express it in the form $A \sin(\alpha t) + B \cos(\alpha t)$.

(10) Find the period, frequency, amplitude, and phase shift for the function

$$g(t) = \sin(1200\pi t) + 2 \cos(1200\pi t)$$

and express it in the form $d \sin(\alpha t + \beta)$.