

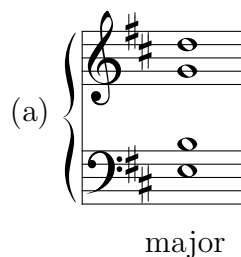
EXAM II

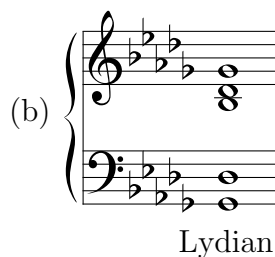
Math 109 / Music 109A, Fall 2022

Name _____ Id _____

Each problem is worth 10 points. Round off each decimal approximation to two digits to the right of the decimal.

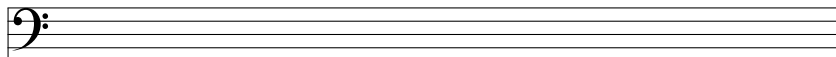
1. Identify these chords by root note with suffix (e.g., Gm⁷ or B^b aug) and by root scale note with suffix (e.g., III⁷ or \sharp IV m) relative to the indicated mode. to be the lowest note.

(a) 
major

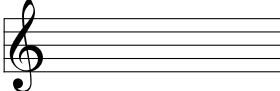
(b) 
Lydian

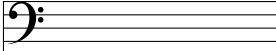
2. Write these chords with correct spelling on the bass clef below.

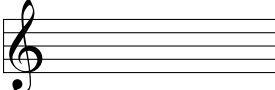
(a) F \sharp m⁷ (b) G aug (c) D^b (d) C \sharp ⁷



3. Write these chords with correct spelling on the given clef, using the indicated key signature and mode. You may notate the key signature if you wish, but this is not required.

(a) $\flat\text{II}^7$ in the key of C major 

(b) VIIm^7 in the key of D minor 

(c) IM^7 in the key of A Myxolydian 

4. Express each of these musical intervals as an element of \mathbb{R}^+ three ways:
(1) as a power of 2, (2) as a radical or the reciprocal of a radical, and
(3) by a decimal approximation.

(a) down 46 cents

(b) up a minor sixth

5. Convert to the specified additive measurement the intervals given by the following ratios.

(a) $19/16$, convert to semitones

(b) $\pi/6$, convert to cents

6. A string on a stringed instrument has length 50 cm. Indicate the positions of the single fret which will allow the string to play the note (a) a keyboard minor third above the original pitch, and (b) a ratio $6/5$ with the original pitch.

7. Complete the following to a four-part harmonization of the given melody, major mode, using only whole notes, so that the melody is the top part, the lowest note is always the root, and the result has two parts on each staff. The chords should be the those indicated under the staff.

$I \qquad II^7 \qquad V^7 \qquad I$

8. Evaluate these logarithms without a calculator. Write down each step of the simplification. You may express your answer as a fraction.

(a) $\log_3 \left(\frac{81}{\sqrt{3}} \right)$

(b) $\log_b \left(\frac{b^p}{\sqrt[m]{b^\ell}} \right)$

9. Write on the staff the keyboard note which best approximates the frequency having the given interval ratio $r = 3/13$ from the given note. Compute the error in cents.



10. For the functions $f(x)$ and $g(x)$ defined below, explain how $g(x)$ can be obtained from $f(x)$ by means of one of the standard geometric transformations.

(a) $f(x) = 3^x$, $g(x) = 7^x$

(b) $f(x) = \log_{25} x$, $g(x) = \log_5 x$