

EXAM I

Math 109 / Music 109A, Spring 2020

Name _____ Id _____

Each problem is worth 10 points.

1. Aural: Circle the triad type.

(a) major
minor

(b) major
minor

2. Sketch the graphs of these functions by starting with a more basic function and applying one or more geometric transformations (shifts or stretches). Use the space on page 4 if you need it.

(a) $f(x) = x^2 + 1$

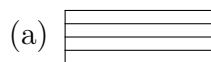
(b) $g(x) = -1 + \sin 3x$

3. For the following pairs of integers m, n , find the numbers q and r whose existence is asserted in the division algorithm ($n = qm + r$):

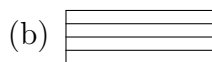
(a) $11, -23$

(b) $3, 42d + 5$ (where d is some integer)

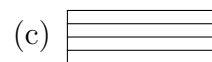
4. Write the indicated note as a whole note, choosing and notating an appropriate clef.



B₂



G₅[#]



E₄^b

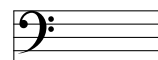
5. For the set \mathbb{Z} and a fixed positive integer m , show that the relation \equiv defined by $k \equiv \ell$ if and only if $m \mid (k - \ell)$ is an equivalence relation. Explain why there are exactly m equivalence classes.

6. For the following modes and tonic notes, indicate the appropriate key signature on the given staff, taking note of the clef:

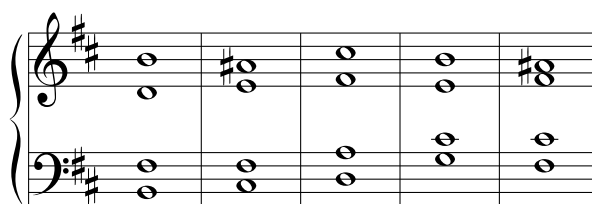
(a) Lydian with tonic D



(c) Phrygian with tonic C[#]



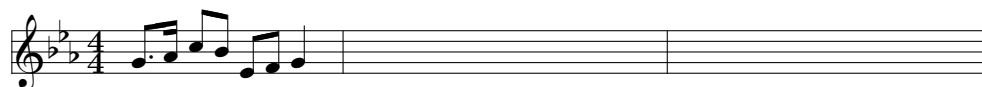
7. Identify each chord in this minor mode (Aeolian) passage. Above the staff label each chord by root note class with suffix (e.g., E^{b7}). Below the staff, label each chord by root scale tone (e.g. ^bIII⁷).



8. Extend the following melody with two measures having the same rhythm, employing the following transformations. Do not write in a key change.

(a) diatonic up two scale tones in the second measure

(b) chromatic up a major third (from the original) in the third measure



9. Give the total duration in beats of:

(a) a doubly-dotted quarter note in $\frac{2}{2}$ time.

(b) a half note in $\frac{9}{8}$ time (compound time signature).

(c) an eighth note quintuplet in $\frac{4}{4}$ time.

10. For the song *Mary Had A Little Lamb*, give the form (e.g., AABC) by dividing it into segments consisting of two bars. Locate and identify a translation other than that which comes from the overall form.

The image shows the first two lines of musical notation for the song "Mary Had A Little Lamb". Both staves are in treble clef, with a key signature of three flats (B-flat, E-flat, A-flat) and a common time signature (C). The first line contains the lyrics: "Ma- ry had a lit- tle lamb, lit- tle lamb, lit- tle lamb,". The second line contains the lyrics: "Ma- ry had a lit- tle lamb, his fleece was white as snow." The melody consists of quarter notes and half notes.