(1) **Aural:** Identify the triads by circling the correct answer. (Each triad will occur at most once.)

(a) major
   minor
   diminished
   augmented

(b) major
   minor
   diminished
   augmented

(c) major
   minor
   diminished
   augmented

Identify the four note chords. (Each chord will occur at most once.)

(d) seventh
   minor seventh
   diminished seventh

(e) seventh
   minor seventh
   diminished seventh

(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 \( r \neq 1 \). Explain how this formula can be used to calculate the duration of a multi-dotted note.
(3) Complete each excerpt with a measure which repeats the rhythm of the first measure, employing:

(a) diatonic transposition up one scale tone.

(b) chromatic transposition up a minor third.

(4) Write these chords in root position in the given mode and key signature with correct spelling:

(a) III<sup>aug</sup>, minor mode

(b) I<sup>m</sup>7, Phrygian mode

(c) bVI<sup>7</sup>, major mode

(5) Identify each chord in this major mode passage by root note with suffix (e.g., E<sub>b</sub>7). Write your labeling under each chord.
(6) Given that $A_4$ is tuned to 440 Hz, give the frequencies of:

(a) $A_2$
(b) $E_5$
(c) the pitch which is 61 cents sharp of $A_4$

(7) 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) Dorian  (b) Lydian
(c) Locrian  (d) Phrygian

(8) A string on a stringed instrument has length 20in. Indicate the positions of three frets which will allow the string to play the sequence of notes which goes up by major (keyboard) thirds ending on the octave.

(9) Express as interval ratios, i.e., elements of $\mathbb{R}^+$, these intervals. Write each as a power of 2 and as a decimal approximation with 2 digits to the right of the decimal.

(a) 3 octaves  (b) down a tritone
(c) 57 cents  (d) down 13 semitones

(10) Convert the interval ratio $r$ to the additive measurement indicated. Round off to 2 digits to the right of the decimal.

(a) $r = \frac{5}{4}$ to cents
(b) $r = 3$ to semitones
(c) $r = \frac{7}{6}$ to octaves