Assignment XI, PHYS 150 (Physics of Sound and Music) Musical Scales and Temperament, Sounds in Space, and Digital Audio Due 4/4/14

This homework assignment has material from class lecture as well as from presentations given by your classmates. You may wish to go use the links near this assignment on the course webpage (http://larsenml.people.cofc.edu/phys150_spr14.html) to find materials supplied by your classmates that should aid in solving these problems. If you gave one of the presentations, you still have the answer the associated questions. Good luck.

- 1. How many cents does the syntonic comma correspond to?
- 2. A major triad has two intervals a major third, and then a minor third above the major third (like C E G). When you explore this carefully, you realize that the frequencies come in a ratio of 4:5:6. A minor triad has two intervals as well a minor third and then a major third above the minor third (like C Eb G). When you explore this carefully, what is the ratio of frequencies in this case? (Make sure each value is an integer no fractions!).
- 3. Two pitches on a touch-tone phone are 941 Hz and 697 Hz.
 - a) What is the frequency ratio between these two pitches?
 - b) How many cents apart are they?
 - c) What is the closest musical interval to this frequency ratio?
 - d) If you play these two frequencies at the same time, would you perceive the interval in part (c) as sharp or flat of the true interval?
- 4. What is Helioseismology?
- 5. Which non-Earth planet was lightning first discovered on?
- 6. About how much of the static in TV and radio signals is a result of cosmic microwave background radiation?
- 7. If you have a 10 Hz sine wave sampled at 11 Hz, does the sample sine wave oscillate at 10 Hz?
- 8. In the "audible effects of aliasing and quantization error" video, at what bit-depth range can you start to hear/notice crackling in the signal?