

MAT 120 — Homework 3 — Fall 2020

Due date: Tuesday, October 6

1. Find at least 5 of the new implied frequency ratios, and also their cent values, in the extension of the Just Chromatic Scale to two octaves. Do not write the entire list of ratios that occur between each note in the scale, only write those that have not appeared before in the first octave of the Just Major Scale. Classify these new implied frequency ratios by their interval type, as would be used in Music Theory. (If you do some scratch work and end up writing some which already appeared before, just cross those out and box the new ones which you are saving.)
2. How many times does the $\frac{5}{4}$ Just Major Third appear from one degree of the two octave Just Chromatic Scale to another? Same question for the $\frac{4}{3}$ Perfect Fourth and the $\frac{3}{2}$ Perfect Fifth.
3. For two harmonic tones with the given fundamental frequencies F_1 and F_2 , find the first example of harmonics which will beat at some number less than 25 beats per second. Say which harmonic number for each of the tones is the one that beats with the other harmonic from the other tone. (Note: Do not include the fundamental which is the first harmonic.) Give the number of beats to one decimal place accuracy. If no pattern can be found with at most 25 beats per second, say No Audible Beats.
 - (a) $F_1 = 220$, F_2 is an equal tempered semi-tone above F_1 .
 - (b) $F_1 = 220$, F_2 is an equal tempered whole tone above F_1 .
 - (c) $F_1 = 220$, F_2 is an equal tempered minor third above F_1 .
 - (d) $F_1 = 220$, F_2 is an equal tempered major third above F_1 .
 - (e) $F_1 = 220$, F_2 is an equal tempered Perfect fourth above F_1 .
 - (f) $F_1 = 220$, F_2 is an equal tempered Tritone above F_1 .
 - (g) $F_1 = 220$, F_2 is an equal tempered Perfect fifth above F_1 .
 - (h) $F_1 = 220$, F_2 is an equal tempered minor sixth above F_1 .
 - (i) $F_1 = 220$, F_2 is an equal tempered major sixth above F_1 .
 - (j) $F_1 = 220$, F_2 is an equal tempered minor seventh above F_1 .
 - (k) $F_1 = 220$, F_2 is an equal tempered major seventh above F_1 .