Physics of Music
Physics 341
Assignment 3

1)a) How many ocataves and semitones are the two notes with frequency 300Hz and 2700Hz apart?

b)A soprano sings two notes (in succession) a perfect fifth apart. What is the difference in frequency between the two notes if the lower one is sung at 450Hz.

2)a) A workman is exposed to a sound of 60dB for 7 hours, and 100dB for one hour without hearing protection. What is the average energy rate of the sound that he received during the course of the day? The Workman's compensation says that if the average energy rate is higher that 80dB during 8 hours, hearing protection must be provided. Is the company in compliance?

b) The standard in BC for Railway workers is that the average noise level must not exceed 87dB for an 8 hour day. BC mandates the 3dB rule, namely that the time of exposure must be halved for each 3dB rise in the average noise level. How long could a railway worker work in a place (eg a disco) with an average noise level of 120dB? In Ontario, the requirement is that the worker is allowed to be exposed to 90 dB for an 8 hour day, and that the time is halved for each 5dB rise in noise level. How long would a Ontario worker be allowed to work in that same disco.

3) In graph 1, add the two waves to get the composite wave.

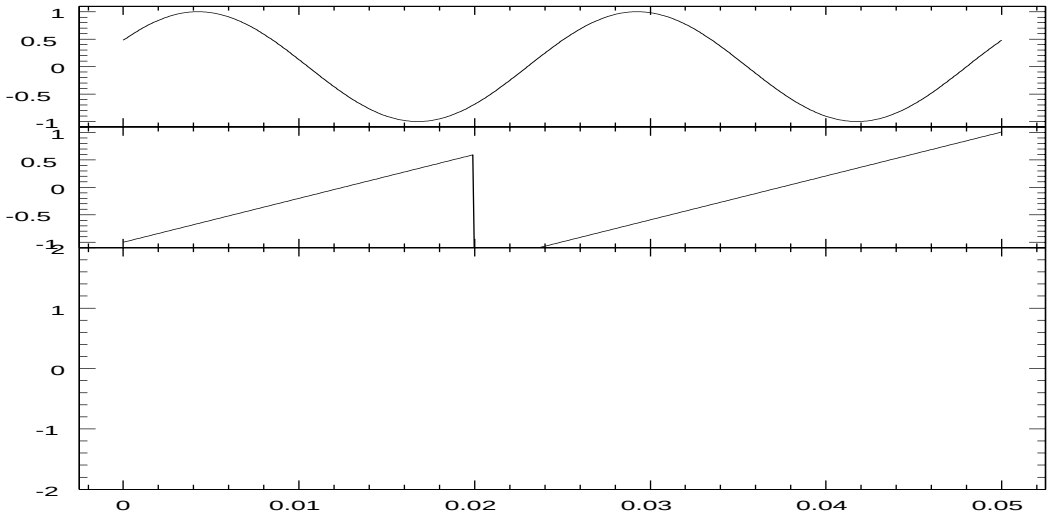

Figure 1

4) When I sing in bed, after I stop it seems that the bed is singing a note back to me. What is going on here?

5) I want to tune one string 2 Hz below another. How could I do this by listening to the two strings together?

6) The sun at high noon in the tropics shines on the ground with an intensity of $1kW/m^2$. If this were sound instead of light, what would be the intensity of the sound in dB on the standard scale with the reference of $10^{-12}\ W/m^2$?