Physics of Music
Physics 341
Assignment 3

1) In the graph of dB versus frequency,
    i) What frequencies correspond to -35dB?
        What pitches (including names) correspond to these frequencies?
    ii)What dB correspond to 1900 Hz? 200Hz? 6000Hz? What pitches
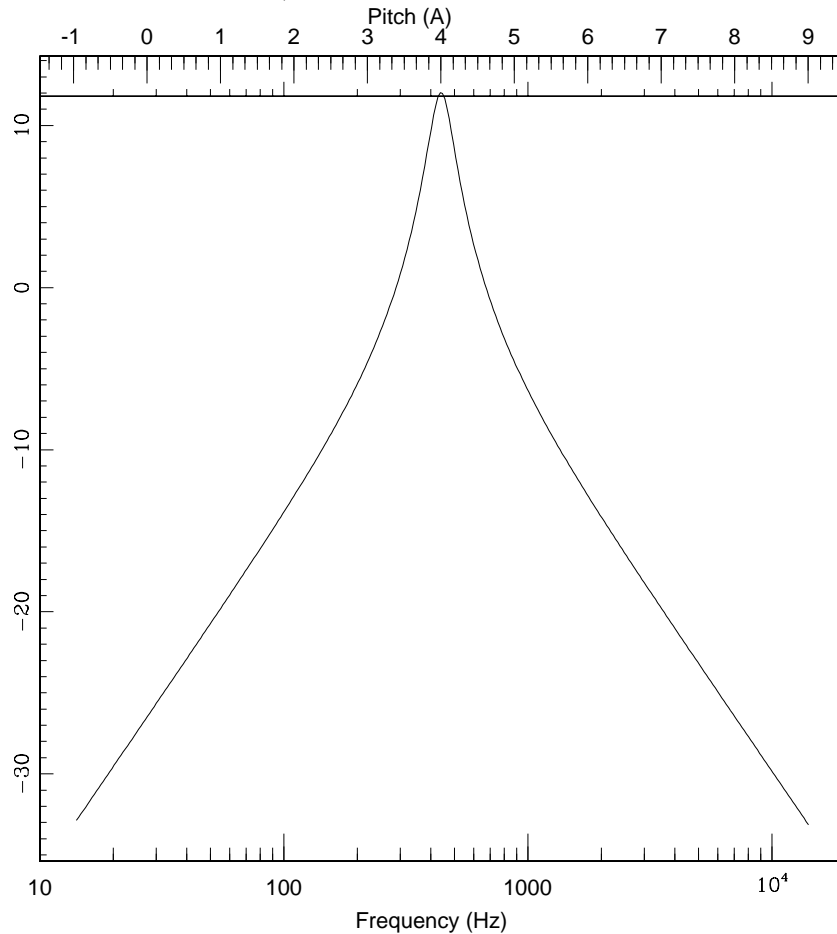correspond to these frequencies?)

Figure 1

Note that this graph is the graph of the "resonance response" of the energy
(not amplitude) of an oscillator to an external driving force which has the same
amplitude at each frequency. Note the 6 dB per octave fall off in the energy on
either side of the resonant frequency (which occurs at 440 Hz).

1

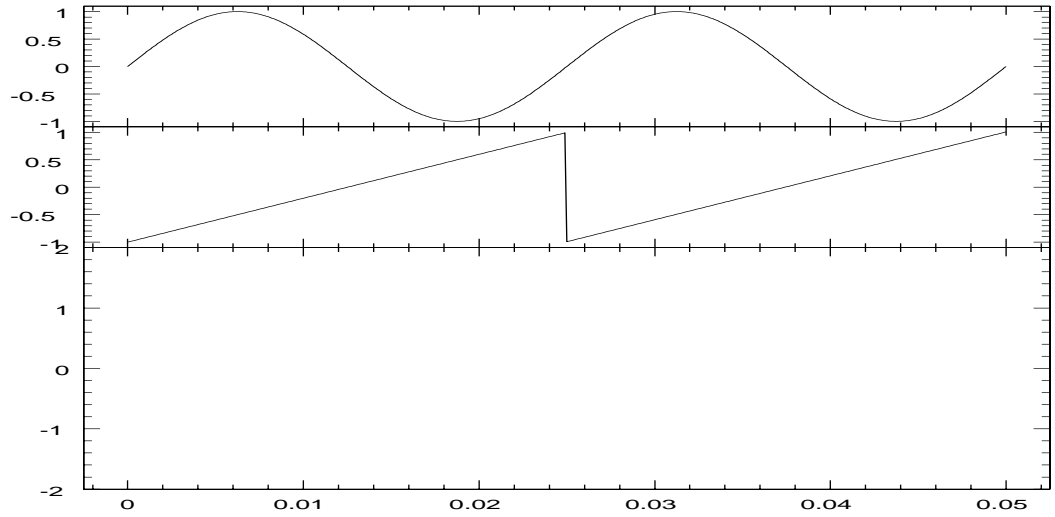2) In graph 2, Add the two waves to get the composite wave.

Figure 2

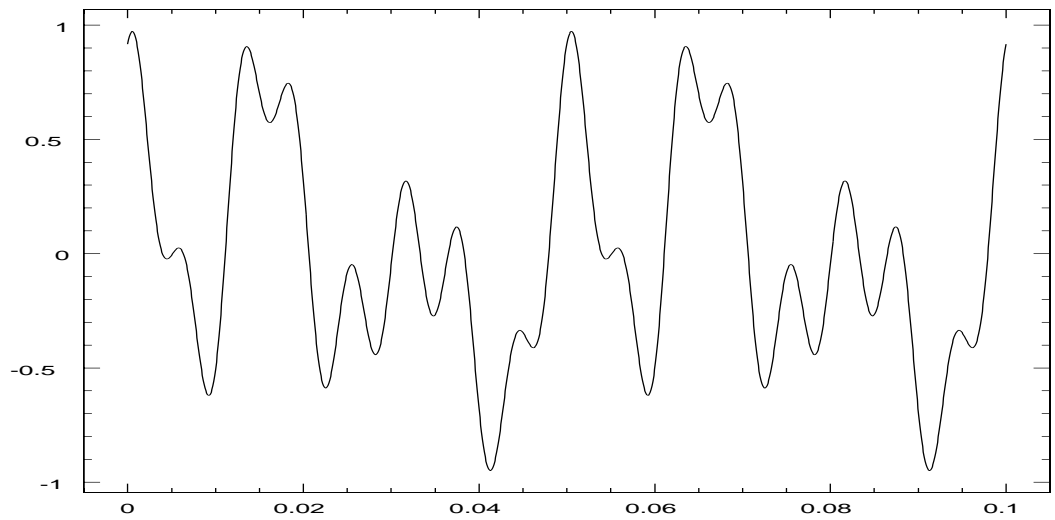3) In graph 3, estimate which what the highest harmonic which would be neededto make up the complex wave form?

Figure 3

4)In graph 4 of the "spectrum" (the Fourier components of a sound), which harmonics of the fundamental are present?
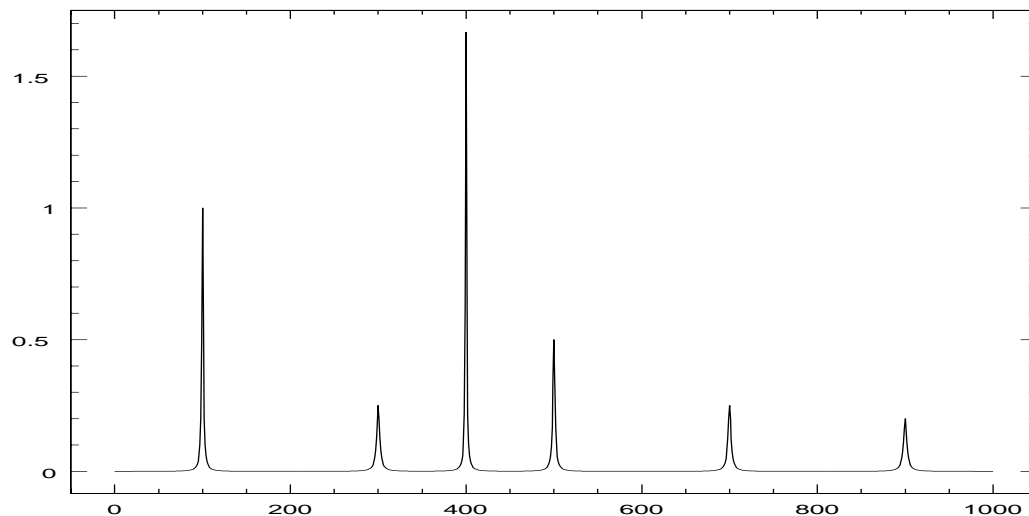
2

Figure 4

5) A note A 440 and the note C#, a major third above are played at the same time. The C# is tuned to the equal tempered scale. What would be the frequecy of the beats of the first of the (almost) equal frequency harmonics of the two notes?

6)A string is plucked at a point 2/5 of the way from one end. Estimate the strength of vibration of the first 5 harmonics of the string. How would this compare to plucking the string at a distance 1/3 of the way from an end? (Remember the recipie for vibrations of the plucked or struck oscillator)

7) How much louder (in dB) is a choir of 80 voices than i)a single singer? ii) two singers iii) 10 singers. Assume that each singer produces the same energy output in sound while singing.