Exam 1

1. A violin string has a length of 0.6 m and a mass of 0.8 g.

    a. Make a diagram showing the standing wave pattern for the first three harmonics on the string.
    b. What is the wavelength of the fundamental?
    c. What tension in the string would cause the fundamental frequency to be 440 Hz?

2. An electron is placed at a point in space where there is an electric field of 50 N/C directed due east.

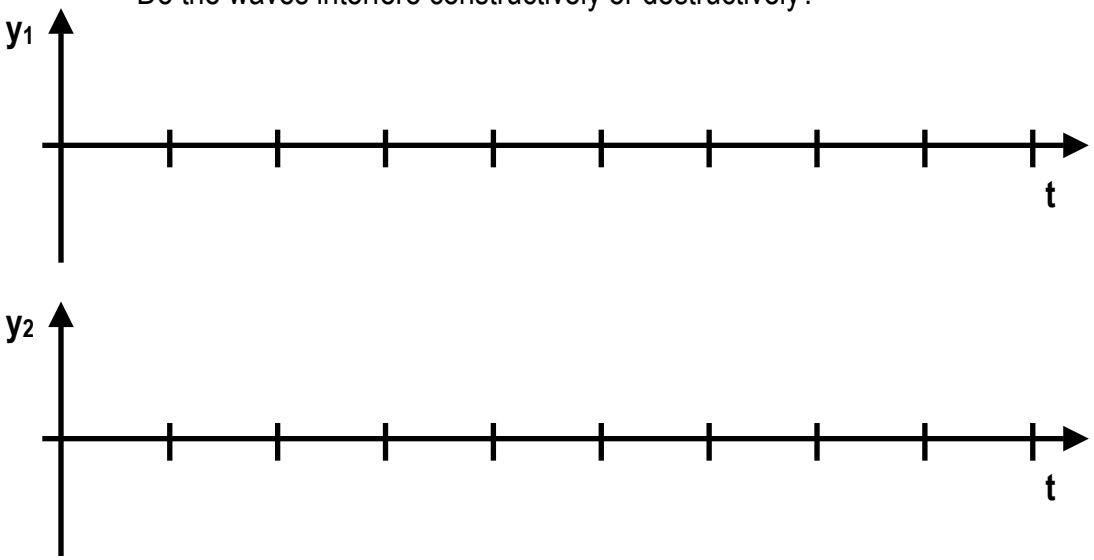
    a. Find the magnitude of the electrical force exerted on the electron.
    b. What is the direction of the force exerted on the electron?

3. You are riding your bicycle directly away from a stationary source of sound and hear a frequency that is 1.0% lower than the emitted frequency. The speed of sound is 343 m/s. What is your speed?

4. Draw the waves described in the following scenario:

"Plug two speakers into the same wave function generator, wired oppositely, both facing you but one speaker 1.5 λ in front of the other."

Do the waves interfere constructively or destructively?



5. Explain what simple harmonic motion is and what causes it. Give three examples of objects that move with simple harmonic motion.

6. A 3 kg mass is attached to a spring and slides on a frictionless horizontal surface. The mass executes simple harmonic motion with an amplitude of 12 cm and a frequency of 3.5 Hz.

a. Write an equation that describes the position x(t) of the mass as a function of time.
b. What is the total energy of the system?
c. What is the maximum velocity of the mass and where does it occur?

7. A certain guitar string has a fundamental frequency of 300 Hz. By what percentage would the fundamental frequency change if the tension in the string were reduced by 12% ?

8. A point source of sound creates an intensity of 60 dB for a listener at a distance of 100 m from the source. How many dB would a listener experience at a distance of 10 m from the source?