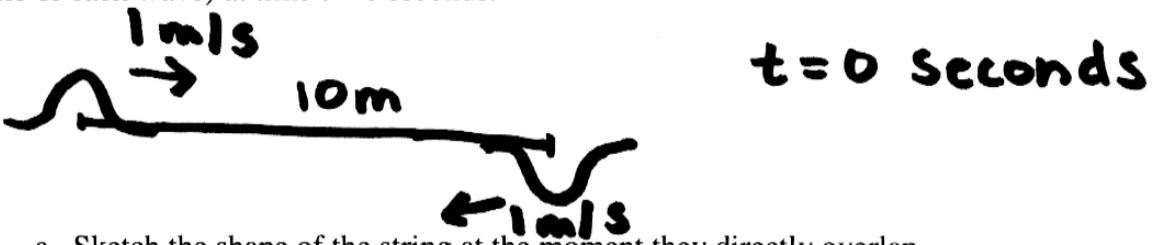
Name:_____ Handed Out: October 14, 2003

Teacher: _____ Due: October 21, 2003

Wave Interference 2 Problems
Physics First! : Honors Option
(Assignment falls under problem solving category.)

1. Two pulses travel toward one another (see below). They are identical but inverted. Each pulse travels at 1 m/s toward the other. They are 10 m apart (measured from the middle of each wave) at time t = 0 seconds.



a. Sketch the shape of the string at the moment they directly overlap.

b. At what time will this occur?

c. What has happened to the energy in the string at this moment?

d. Sketch the string at time t = 10 seconds.

2. Two traveling waves can superimpose to form a standing wave. Explain in your own words how this happens. Can a standing wave transmit energy?

3. What is the definition of a node? What is the definition of an antinode? Draw a picture to illustrate.

4. Suppose that a string supports a standing wave with a node at a particular location. How would things change if the point of the node were clamped physically?

5. Standing waves can be excited on a string of length L = 1 m whose ends are fixed at x = 0 and x = L.

   a. What is the longest wavelength that can fit on this string? Sketch it below.

   b. What is the second longest wavelength that can fit on this string? Sketch it below.

c. Sketch the third longest wavelength that can fit on this string. Do you see the pattern? What is it?

6. A violin string vibrates at 440 Hz as its fundamental frequency.
   a. What is the frequency of the second harmonic?

   b. What is the frequency of the third harmonic?

7. A particular string fixed at both ends resonates in four loops at a frequency of 220 Hz. Name another frequency at which it can resonate. Why can't the string resonate at an arbitrary frequency?

8. Standing waves can be excited on a string of length L = 1 m. Suppose the string is set up such that it is fixed (has a node) at x = 0, and free (has an antinode) at x = L.
   a. What is the longest wavelength that can fit on this string? Sketch it below.

   b. What is the second longest wavelength that can fit on this string? Sketch it below.

c. What is the third longest wavelength that can fit on this string? Sketch it below.

d. Do you see the pattern? What is it?