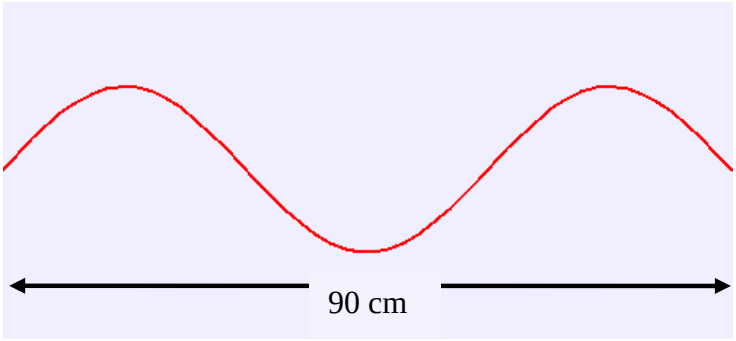
NS544 worksheet 3 **Name: _____**

PROBLEM 1 – 10 points

The picture shows a particular standing wave on a guitar string at one particular instant in time. At the anti-nodes, the oscillations have an amplitude of 4.0 mm. The wave speed on the string is 360 m/s, and the string has a length of 90 cm.



[2 points] (a) Determine the wavelength of this wave.

[2 points] (b) Calculate the frequency of this standing wave.

[2 points] (c) This standing wave is formed by a superposition of two identical traveling waves, one moving left and one moving right. The amplitude of each of these traveling waves is

[ ] 1.0 mm [ ] 2.0 mm [ ] 4.0 mm [ ] 8.0 mm

[2 points] (d) Compared to the frequency of the standing wave shown above, the fundamental frequency for this particular string is ….

[ ] larger by a factor of 3 [ ] smaller by a factor of 3

[ ] equal to the frequency of the wave shown

[2 points] (e) If the tension of the string is increased, this string's fundamental frequency …

[ ] increases [ ] decreases [ ] remains the same

Simulation Worksheet: Doppler Effect

On the http://physics.bu.edu/~duffy/NS544.html site, find the "Doppler Effect" simulation, and carry out these activities.

Start with some qualitative questions. In each case, fill in the first blank with either "wave speed" or "wavelength", and then fill in the second blank with either "increases" or "decreases". Then use $v = f\lambda$ to determine whether the frequency of the wave observed by the observer will be higher or lower than the frequency emitted by the source.

1. When the source moves toward a stationary observer, the effective _____ for the waves _____. Thus, the observed frequency is _____ than the emitted frequency.

2. When the source moves away from a stationary observer, the effective _____ for the waves _____. Thus, the observed frequency is _____ than the emitted frequency.

3. When the observer moves toward a stationary source, the effective _____ for the waves _____. Thus, the observed frequency is _____ than the emitted frequency.

4. When the observer moves away from a stationary source, the effective _____ for the waves _____. Thus, the observed frequency is _____ than the emitted frequency.

Let's now investigate whether the Doppler effect for sound is a relative velocity phenomenon. In other words, is a source traveling a some speed toward a stationary observer equivalent, in terms of the frequency observed, to an observer traveling at the same speed toward a stationary source?

First, make a prediction regarding whether the following statement is true or false.

The Doppler effect for sound is a relative velocity phenomenon. TRUE FALSE

Now, use the simulation to either confirm or deny the statement, and explain how you do it.