PREFLIGHTS **LESSON 14 – THE WAVE EQUATION**

LEARNING OBJECTIVE:
Formulate the defining properties of a wave and give a mathematical description of those properties.

1) The wave equation for a string is derived on pp 365-366 of Griffiths. Consider Figure 9.2 in Griffiths, which depicts a wave pulse moving down a string. Under what conditions will Griffiths' analysis for the wave motion of a string break down?

a. when the string tension, T, is too big
b. when θ or θ' are too big
c. when the radius of curvature of the top of the pulse is too big

2) A heavy cable is hanging vertically, its bottom end free. How will the speed of waves near the top and bottom of the cable compare? Why?

3) Consider a light wave and a sound wave with the same wavelength. Which has a higher frequency?

4) Study Example 9.1. I can't do the squiggly thing on top of the complex wave function, so let's just say that f_1, f_2, f_3, and f_4 are complex wave functions. According to Example 9.1, $\mathrm{Re}(f_1) + \mathrm{Re}(f_2) = \mathrm{Re}(f_1 + f_2) = \mathrm{Re}(f_3)$. Is it also true that, if $f_1 \cdot f_2 = f_4$, then $\mathrm{Re}(f_1) \cdot \mathrm{Re}(f_2) = \mathrm{Re}(f_1 \cdot f_2) = \mathrm{Re}(f_4)$?

5) ***Note: This is a review question from Chapter 7.*** Your friend thinks he's found a way to get free electricity. He bought a cheap, but big and powerful, horseshoe magnet off of eBay. He knows from Physics 215 that dropping a wire loop through the magnet will generate a current which can be used to power light bulbs, charge a cell phone, etc. "And the magnet does all the work!" He tells you. Is he correct that the magnet does all of the work? If not, what is doing the work to generate the electric current?

6) What did you find difficult or confusing in the pre-class work? If nothing was difficult or confusing, tell me what you found most interesting. Please be as specific as possible.

7) Document whatever help you received on the preclass work.