Physics 201, Fall 2009
Problem Set 1
Due Friday, September 11.

General Problem Set Instructions: You may work together, but you must write up your solutions independently (*i.e.* don't copy anyone else's solutions). You *must* show all of your work. No credit will be given for the final answer unless it is derived or explained, nor will credit be given for solutions to the wrong problems. Problem sets will be available at the course website, http://physics.wm.edu/∼erlich/201F09/ and will be due in class one week after they are handed out.

Problems from Taylor, Zafiratos and Dubson:

1.6, 1.9, 1.15, 1.23, 1.24, 1.26

Additional Problem: *Michelson-Morley Experiment*

Consider the classical (incorrect) assumption that the speed of light is c only in the rest frame of the ether.

The light's period is the amount of time it takes for the light to complete one full wavelength, $T = \lambda/c$. If the magnitude of the time difference $|\Delta t|$ between the two paths of light in the Michelson-Morley experiment were $T/2$, the two waves would be exactly out of phase and would interfere destructively, leaving a dark spot on the screen. If the magnitude of the time difference were T, the waves would be in phase and would interfere constructively, leaving a bright spot on the screen.

Consider the situation described in class, with the speed of the experiment relative to the ether v=3×10^4 m/s oriented along one of the beam arms; the distance from the half-silvered mirror to each mirror l=11 m; and wavelength of light λ=590 nm. What fraction of a period does the difference in travel times correspond to, *i.e.* what would be $\Delta t/T$ for this experiment if the classical view were correct?