Physics II

Maxwell's Equations

Problem 1.- True (T) or False (F):

( ) $c = \sqrt{\mu_\circ \varepsilon_\circ}$

( ) $\nabla.\vec{E} = 0$ in vacuum

Problem 2.- True (T) or False (F):

( ) $\nabla.\vec{B} = 0$ means that there are no magnetic monopoles

( ) Newton's second law of motion F=ma is incorrect at high velocities

Problem 3.- In what units do you measure?

(i) Electric potential (ii) Electric field (iii) Magnetic field

Problem 4.- Are the wavelengths of AM radio stations shorter or longer than those of visible light?

Problem 4a.- Are the wavelengths of TV transmissions shorter or longer than those of visible light?

Problem 5.- If the electric field in an electromagnetic wave traveling south oscillates east-west, in what direction is the *magnetic* field oscillating?

Problem 6.- How long does it take for a signal from Voyager-1 (currently 15.1×10^{12} m from our planet in 2007) to reach the Earth?

Problem 7.- Based on your newly acquired knowledge of electromagnetic waves, why would you say that water is heated in a microwave oven, but air not so much?

Problem 8.- If a radio transmitter has a vertical antenna, should a receiver antenna (rod type) be vertical or horizontal to get the best reception? Why?

Problem 9.- A typical cell phone antenna is designed so it is ¼ of the wavelength of the carrier signal. Calculate the length of the antenna for a cell phone operating at 1.9GHz.

Problem 10.- One of Maxwell's laws is that $\oiint \vec{B}.d\vec{S} = 0$. This is also called the Magnetic Gauss Law. Which of the following graphs of magnetic lines violated this law?