Phys 3330 Electricity & Magnetism II
Spring 2019
Assignment #12 - due Monday April 29th 2019

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1. Show that in the Lorentz gauge the electrostatic potential satisfies the equation

$$\nabla^2 V - \frac{1}{c^2}\frac{\partial^2 V}{\partial t^2} = -\frac{\rho}{\epsilon_o}$$

2. Show that $E^2 - c^2B^2 = E'^2 - c^2B'^2$. Why must this be true?

3. Show that **E.B** = **E'.B'**. (This shows that the transformation of the fields does not alter the fact that each observer sees a photon moving in an unbounded medium as a transverse wave.)

4. A stationary observer sees constant fields **E** and **B**. Find the conditions (there are two) that there is a moving observer who detects no magnetic field, and find his velocity.