

Phys 3330 Electricity & Magnetism II
Spring 2019
Assignment #8 - due Friday March 29th 2019

1. Spherical waves. Starting with the wave equation $\left(\nabla^2 E = \frac{1}{v^2} \frac{\partial^2 E}{\partial t^2}\right)$ in spherical polar coordinates, and letting $E = E(r,t)$ only, show that

$$E(r, t) = \frac{1}{r} [f(r - vt) + g(r + vt)]$$

where f and g are arbitrary functions. (Hint: start by writing $E = F/r$ and substitute into the wave equation to get a differential equation in the function $F(r,t)$.)

What does each term represent physically, and what is the significance of the factor $1/r$? (Hint: think Poynting vector.)

2. For light incident normally on a glass ($n = 1.56$) surface, what fraction of the light is reflected?
3. What is Brewster's angle for light in glass ($n = 1.56$) falling on a boundary with air ($n = 1$).
4. What is the critical angle for total internal reflections for light in glass ($n = 1.56$) falling on a boundary with air ($n = 1$).