PHYS 362
Assignment 1

1. An electromagnetic wave has an electric field given by $E = -2.00V/m \cdot Exp[i(1.00x10^7 z + 2.00x10^{15} t)]$. (a) What is the index of refraction of the medium in which it is traveling? (b) what is the irradiance of the wave? (c) Would this wave appear bright to the human eye? Explain your answer.

2. Two waves with the same frequency, speed, and amplitude travel together in the same region of space. Their wavefunctions are given by: $\Psi_1 = A\sin(kx + \omega t - \pi/5)$ $\Psi_1 = A\sin(kx - \omega t - \pi/6)$

   Derive an expression for the resulting wave. Plot the wave at 8 different times in order to best show its time-evolution. Plot the x-axis in radians. Give the value of the node nearest to the origin. Show your work.

3. An electromagnetic wave propagates in free space. It's B-field is given by the expressions $B_x = B_z = 0$ and $B_y = 18x10^{-8}\sin[4\pi 10^6(z - 3x10^8 t)]$. Write an expression for the E-field. Calculate the wavelength of the wave in free space and in a medium with a dielectric constant of 2.1.