Homework 7 (due: April 23)

1. How long does it take light to travel 10000 m in a material with index of refraction 1.4?

2. A traveling wave is described by the following equation $E(x,t) = 4.5 \sin(3.5 x - 1.5 t)$. Find (a) the period, (b) the wavelength, and (c) the speed of this wave.

3. A double-slit experiment is performed with light of wavelength 500 nm. The bright interference fringes are spaced by 1.5 mm apart on the viewing screen. What will the fringe spacing be if the light is changed to a wavelength of 700 nm?

4. A double-slit interference pattern is created by two narrow slits spaced 0.1 mm apart. The distance between the third and the sixth minima on a screen 80 mm behind the slits is 1.2 mm. What is the wavelength of the light used in the experiment?

5. A double-slit experiment is performed with light of wavelength 600 nm. The bright interference fringes are spaced by 8 mm apart on the viewing screen. What will the fringe spacing be if the whole system is placed in a medium with index of refraction of 1.5?

6. A laser beam with wavelength 500 nm is incident on two slits 0.5 mm apart. The interference pattern is observed on a screen 1 m away from the plane of the slits. Determine the number of maxima on the screen within an interval $-2.5 \text{ mm} < y < 6.5 \text{ mm}$. Point y=0 corresponds to the center of the pattern.

7. A double-slit experiment is performed with light of wavelength 550 nm. The interference pattern is observed on a screen 90 cm away from the plane of the slits. The slit separation is 0.1 mm. What is the distance between the first and the sixth maxima?