**Problems: Week 14**

14-1. We can hear sound around a corner but no light will go around a corner. Why?

14-2. In a double-slit experiment using yellow light of wavelength 589nm the slits are 0.2mm, apart. What is the separation between any neighboring pair of dark fringes on a screen that is 1m away?

14-3. What is the difference between interference and diffraction?

14-4. In 2-slit interference the first minimum occurs when the path difference between the 2-waves is $\frac{\lambda}{2}$, in single slit diffraction for the first minimum the path difference between the extremal waves must be $\lambda$. Why this difference?

14-5. The wavelength range of visible light is from about 400nm to 700nm. If you perform a double slit experiment with a slit separation of 0.1mm, what is the range of angles separating the first maximum from the first minimum?

14-6. In the recent BP disaster a large quantity of oil ($n = 1.2$) spread out on the surface of water ($n = 1.33$). If you were inspecting this from a helicopter looking straight down where the slick thickness is 450nm, which wavelengths of visible light would have the greatest reflection?

14-7. You wish to make a non-reflecting slab of glass ($n = 1.5$) by coating it with a transparent material of ($n = 1.25$). Choosing $\lambda = 600$ nm to do so what minimum thickness of coating would you need? Why?

14-8. In a double-slit interference (neglect diffraction) pattern show that the intensity averaged over the entire pattern is exactly twice the intensity due to radiation from one slit.

14-9. In a single slit diffraction experiment using green light (436nm) the width of the first maximum on a screen 2m away is 1cm. What is the width of the slit?

14-10. Show that the intensities of the maxima in single-slit diffraction are in the ratio

$$1 : \frac{4}{9\pi^2} : \frac{4}{25\pi^2} \frac{4}{49\pi^2} \cdots$$