Physics 422 - Spring 2015 - Assignment #8, Due April 29th

You can turn this in at room 144.

1. *(Hecht, 9.10)* White light falling on two long narrow slits emerges and is observed on a distant screen. If red light ($\lambda_0 = 780$ nm) in the first-order fringe overlaps violet in the second-order fringe, what is the later's wavelength?

2. *(Hecht, 9.21)* The Fresnel birpism is used to obtain fringes from a point source that is placed 2 m from the screen, and the prism is midway between the source and the screen. Let the wavelength of the light be $\lambda_0 = 500$ nm and the index of refraction of the glass be $n = 1.5$. What is the prism angle, if the separation of the fringes is 0.5 mm?

3. The resolving power of a dispersive prism can be expressed

$$\mathcal{R} = \frac{\lambda}{\Delta\lambda} = B\frac{dn}{d\lambda}$$

where B is the length of the base of the prism and $n(\lambda)$ is the wavelength-dependent index of refraction of the material from which the prism is made.

(a) Estimate the resolving power of a prism with $B = 10$ cm made of crystal quartz. Please reference where you found the graph of $n(\lambda)$ for cyrstal quartz.

(b) Compare this resolving power to what can be achieved using a Fabrey-Perot interferrometer. State the assumptions made when estimating $\mathcal{R}$ in this case.

(c) Explain whether you could, or could not, use a prism to resolve the pair of lines in the sodium doublet?