

**Phys 375 - Prof. Hall**  
**Homework #7, due November 24&25, 2008**

1) ( 6 points) The grating in your lab spectrometer is misaligned so that the incoming beam of light has an angle of incidence of one degree. The true normal to the grating points to 56 degrees on the angular scale marked on the telescope side of the spectrometer. If the wavelength of the light is 589 nm (one of the lines of the sodium yellow doublet), and the grating spacing is 1.6 microns, at what angular positions will you find the peaks for orders -1, 0, and 1?

2) The spectrometer is illuminated with light of wavelength  $\lambda = 436$  nm, and the grating is again misaligned by an unknown small angle. You find the order zero peak at 70.5 degrees, and the order one peak at 86.26 degrees. The grating spacing is still  $a = 1.6$  microns.

a) (6 points) Show that the angular position of the true normal to the grating ( $\psi$ ) is given by:

$$\sin(86.26 - \psi) = \frac{\lambda}{a} + \sin(70.5 - \psi)$$

b) (6 points) Solve this equation (with a computer if necessary) to find  $\psi$ . Explain how you solved the equation.

2) Pedrotti, problem 12-1 (5 points).

5) Pedrotti, problem 6-1 (5 points).

6) Pedrotti, problem 6-2 (5 points).