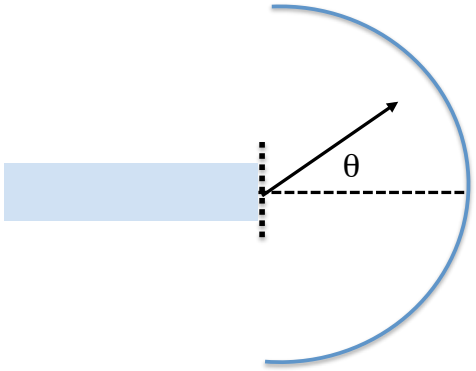
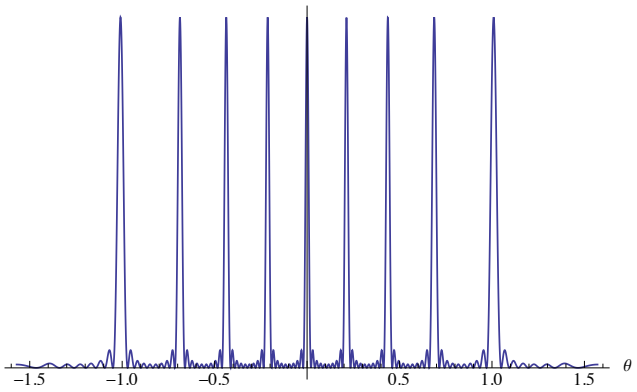
Physics 214 **Quiz 2-1 [20 points]**



a) [5 points] Green light of wavelength 500 nm passes through a grating that has 4200 lines per centimeter and is projected onto a circular screen. Calculate the angle of the first principal maximum.

- sin θ = λ/d = (500nm) /(1cm/4200) -> θ= 0.21 rad

b) [8 points] Sketch the intensity pattern on the screen as a function of the angle θ. What is the highest-order maximum (n) produced by this setup?



(rough sketch good enough, although should look for consistency with n=4 and first peak)

- n=4 (= integer part of d/λ = 4.76)

c) [7 points] If now the light source were only to illuminate 0.2 mm of the grating what happens to the position of the first principal maximum? Estimate the angular width of the middle peak.

- Nothing happens (the principal maxima stay the same)
- Number of slits illuminate: N = 4200 * 0.2 mm / 1cm = 84 and 2 δθ = 2 λ/ Nd = 2 (500nm) /(4200 * 0.2 mm / 1cm * 1cm/8200) = 2*500nm/0.2mm = 0.0097 rad (or half this, accept both)