Phys 2120, Fall 2012
Hint-o-licious Hints, Problem Set #14

32.16 Use the eqns for N–slit interference pattern,

$$d\sin\theta = m\lambda \qquad m = 0, 1, 2, \ldots \qquad \text{maxima}$$

$$d\,\sin\theta = \frac{m}{N}\lambda \qquad \text{minima}$$

where m is an integer, but not a multiple of N. From the given data you can find $\frac{\lambda}{d}$ from the minima equation with $m = 1$. Then use this in the maximum equation with $m = 1$ to get the angle.

32.27 Use the equation for diffraction minima

$$d\sin\theta = m\lambda \qquad m = 1, 2, \ldots$$

to get the angle to the first minimum. The angular width is twice this.

32.44 Here for the two reflected waves there is a change of sign of just one of them so that the condition for *constructive* interference is

$$2d = (m + \tfrac{1}{2})\lambda_{film} \qquad \lambda_{film} = \lambda/n$$

The thinnest film corresponds to $m = 0$.

32.30 Use the diffractive resolving power formula for a circular hole,

$$\theta_{\min} = 1.22\frac{\lambda}{D}$$

32.33 Again use the resolving power formula for a circular hole.

32.51 Here the film is made of air, where one of the reflected beams has a change of sign so the condition for a bright band is

$$2d = (m + \tfrac{1}{2})\lambda \qquad m = 0, 1, 2, 3, \ldots$$

Note that as the air film gets fatter, we have successive values of m for a bright fringe.

Find the order m (the greatest integer) which corresponds to the greatest air-film thickness (the big end of the wedge). Note that in this way of counting we start with $m = 0$ so that the *number of bright fringes* is 1 greater than the value of m from the equation.

$$\lambda f = c \qquad v = \frac{c}{n} \qquad S = S_0\cos^2\theta \qquad n_1\sin\theta_1 = n_2\sin\theta_2$$

$$\frac{1}{s} + \frac{1}{s'} = \frac{1}{f} \qquad m = \frac{h'}{h} = -\frac{s'}{s}$$