Homework Discussion, Week 9

Physics 1302   Dr. Andersen

Chapter 28

19.) We can use equation 28-3 to find the angle between the central bright fringe and first fringe, and then use that angle in equation 28-1. Note that the sharp edges of the 2 razor blades will be separated by the thickness of 1 of the razor blades, so that the slit separation in this case is just the thickness of one of the blades.

32.) a) In this case, we need to use equation 28-11, and solve for the thickness.
b) Using equation 28-11 we can solve for the *longest* wavelength for which there will be destructive interference, this turns out to be $326 \ nm$, which is already in the ultra-violet, so there are no visual wavelengths at which we will get destructive interference.
Answer: a) $123 \ nm$

42.) The angular position of the minima is given by

$$\sin\theta = \frac{m\lambda}{W}.$$

The distance between the two fringes is $y_2 - y_1 = L(\tan\theta_2 - \tan\theta_1)$. Because $y_2 - y_1 << L$, we can use the small angle approximation for the tangent function $\tan\theta \approx \theta$, and for the sine function $\sin\theta \approx \theta$, so:

$$y_2 - y_1 = L(\frac{2\lambda}{W} - \frac{\lambda}{W}).$$

Solve this for W.
Answer: $12 \ \mu m$.