

Ch. 4 Prob. 18

a)  $D = 2.00 \mu\text{m}$

$\lambda_v = 410 \text{ nm}$

Find the angle of the first minimum, for violet light.

$$D \sin \theta = m \lambda \quad m = \pm 1, \pm 2, \pm 3, \dots$$

$m = 1$  corresponds to the first minimum.

$$D \sin \theta = \lambda \rightarrow \theta = \sin^{-1} \left( \frac{\lambda}{D} \right)$$

$$\theta = \sin^{-1} \left( \frac{410 \times 10^{-9} \text{ m}}{2.00 \times 10^{-6} \text{ m}} \right) = \sin^{-1} (0.205)$$

$$\theta_v = 11.8^\circ$$

b)  $\lambda_R = 700 \text{ nm}$

Find the angle of the first minimum for red light.

$$\theta_R = \sin^{-1} \left( \frac{700 \times 10^{-9} \text{ m}}{2.00 \times 10^{-6} \text{ m}} \right) = \sin^{-1} (0.350)$$

$$\theta_R = 20.5^\circ$$