

83. (a) Employing Eq. 37-3 with the small angle approximation ( $\sin \theta \approx \tan \theta = y/D$  where  $y$  locates the minimum relative to the middle of the pattern), we find (with  $m = 1$  and all lengths in mm)

$$D = \frac{ya}{m\lambda} = \frac{(0.9)(0.4)}{4.5 \times 10^{-4}} = 800$$

which places the screen 80 cm away from the slit.

- (b) The above equation gives for the value of  $y$  (for  $m = 3$ )

$$y = \frac{(3)\lambda D}{a} = 2.7 \text{ mm} .$$

Subtracting this from the first minimum position  $y = 0.9$  mm, we find the result  $\Delta y = 1.8$  mm.