

①

Light with a wavelength of 525 nm passes through a slit that is $5.27\text{ }\mu\text{m}$ wide. Determine the distance between the center of the central maximum to the first bright fringe if the screen is 1.66 m away.

$$\lambda = 5.25 \times 10^{-7} \text{ m}$$

$$w = 5.27 \times 10^{-6} \text{ m}$$

$$m = 1.5 \quad \left(\begin{array}{l} \text{recall: } m = \pm 1, \dots \text{ for dark} \\ \qquad \qquad \pm 1.5, \dots \text{ for light} \end{array} \right)$$

$$w \sin \theta = m \lambda$$

$$\theta = \sin^{-1} \left(\frac{m \lambda}{w} \right) = \left(\frac{1.5 (5.25 \times 10^{-7} \text{ m})}{5.27 \times 10^{-6} \text{ m}} \right) \sin^{-1}$$
$$= 8.59^\circ$$

$$y = L \tan \theta$$

$$= 1.66 \text{ m} \tan 8.59^\circ$$

$$= 0.25 \text{ m}$$