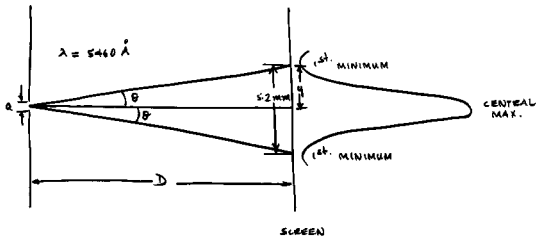


RECITATION INSTRUCTOR (Please Circle)

de Souza

6. In a single-slit diffraction pattern the distance between the first minimum on the right and the first minimum on the left is 5.2 mm. The screen on which the pattern is displayed is 80 cm from the slit and the wavelength is 5460 Å. [5460 Å = 546 nm]
Calculate the slit width.



$$\text{MINIMA: } a \sin \theta = m \lambda \quad (m = 1, 2, 3, \dots)$$

$$\text{HERE, } a \sin \theta = \lambda \quad (1^{\text{st}} \text{ MINIMUM})$$

$$\text{ALSO, } \tan \theta = \frac{y}{D}$$

For our purposes, $\sin \theta \cong \tan \theta$ (θ small)

$$\therefore a \tan \theta = \lambda$$

$$\therefore a = \frac{\lambda}{\tan \theta} = \frac{\lambda D}{y} = \frac{(5.46 \times 10^{-7}) (0.80)}{(5.2 \times 10^{-3} / 2)}$$

$$= 1.68 \times 10^{-4} \text{ m.}$$