① $a \sin\theta = m\lambda$ for minima

(a) Let y_1 = location of first minimum on screen
y_5 = location of 5th minimum

$$y_5 = D\tan\theta_5 \approx D\sin\theta_5 = D\left(\frac{5\lambda}{a}\right)$$

$$y_1 = D\tan\theta_1 \approx D\left(\frac{1\lambda}{a}\right)$$

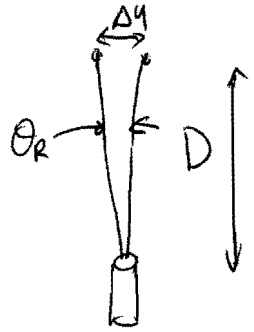
$$y_5 - y_1 = \Delta y = \frac{4D\lambda}{a}$$

$$a = \frac{4D\lambda}{\Delta y} = \frac{4(0.40\,m)(550\times10^{-9}\,m)}{0.35\times10^{-3}\,m} = 2.5\times10^{-3}\,m$$

(b) $$\theta_1 = \sin^{-1}\frac{\lambda}{a} = \sin^{-1}\left(\frac{550\times10^{-9}\,m}{2.5\times10^{-3}\,m}\right) = 0.00022\ rad$$

② $d = 5.1\,m$

$$\theta_R = 1.22\frac{\lambda}{d} = 1.22\frac{550\times10^{-9}\,m}{5.1\,m} = 1.32\times10^{-7}\ rad.$$



$$\Delta y = D\theta_R = (380{,}000\ km)(1.32\times10^{-7}\ rad)$$
$$= 50\ m$$