Determine the distance that the third bright fringe would lie from the central bisector in a single slit diffraction pattern generated with 542 nm light incident on a 1.2 x 10^{-4} m slit falling onto a screen 68cm away.

Solution:
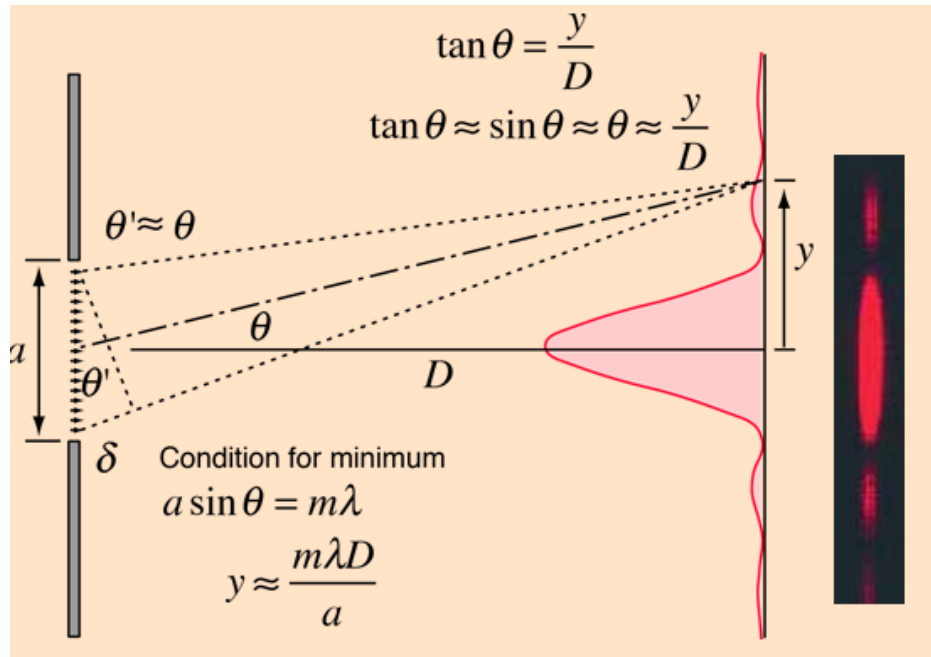
The general condition for a minimum for a single slit is:

$$m\lambda = a\sin\theta$$

where m = 1, 2, 3, 4 and so on

- a is the width of the slit,
- θ is the angle of incidence at which the minimum intensity occurs, and
- λ is the wavelength of the light

The distance of the bright fringe on screen from the central bisector is:

$$y \approx \frac{m\lambda D}{a}$$

Thus,

$$y = \frac{3 \times (542 \times 10^{-9}\ m) \times (0.68\ m)}{1.2\ \times\ 10^{-4}\ m} = 0.009214\ \text{m} \approx 9.2\ \text{mm}$$

Answer: 9.2 mm

Source: http://hyperphysics.phy-astr.gsu.edu/hbase/phyopt/sinslit.html

Answer provided by www.AssignmentExpert.com