Physics 173
Spring Quarter 1983
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George Williams

Grader : ZHU

THIRD MIDTERM

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Name: Ave. 23.6 $\sigma = 3.5$ $N^{\#} = 311$

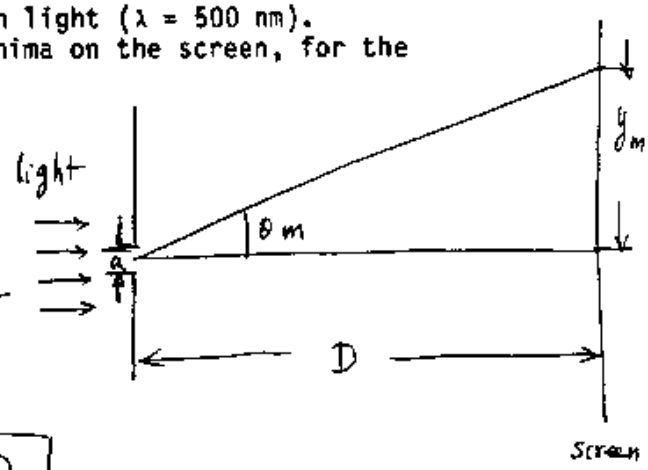
Discussion Instructor (CIRCLE ONE): Abbott Galler Giddings

Discussion Section #_____ Leaver Saffer Stone

All numbers to 3 significant figures!

In a single slit diffraction experiment the 7th minimum from the center in red light (λ = 650 nm) is observed at 15.7 cm from the center of a screen 3.25 m from the slit.

(a) Find the position of the 8th minimum in green light (λ = 500 nm).
(b) Find the distance between the 8th and 9th minima on the screen, for the green light.



SOLUTION:

$a \sin\theta_m = m\lambda$ m th minimum

θ_m is small $\therefore \sin\theta_m \simeq \tan\theta_m = \frac{y_m}{D}$

$\therefore a\frac{y_m}{D} = m\lambda$ $\boxed{\therefore y_m = \frac{m\lambda D}{a}}$

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When $y_m = 15.7$ cm, $\lambda = 650$ nm 7th minimum there

$\therefore a = \frac{7\lambda D}{y_7} = 9.42 \times 10^{-5}$ m

5 (a) $\lambda = 500$ (nm) $m = 8$

$\therefore y_8 = \frac{8\lambda D}{a} = \frac{8 \times 500\,(nm) \times 3.25\,m}{9.42 \times 10^{-5}\,m} \boxed{= 13.8\ (cm)}$

10 (b) $y_9 - y_8 = \frac{\lambda D}{a} = \frac{y_8}{8} = 1.73$ (cm)