

THIRD MIDTERM

Name (print) MOLINA Name (sign) \_\_\_\_\_

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Discussion Section # \_\_\_\_\_

**SHOW ALL WORK!!!!**

**REPORT ALL NUMBERS TO THREE SIGNIFICANT FIGURES!**

Use the conversion constants and data given on the front page.

A two slit interference experiment is performed with two colors of light. The seventh order ( $m = 7$ , where the center is  $m = 0$ ) fringe for light of  $\lambda = 555 \text{ nm}$  is at  $9.50 \text{ cm}$  from the center on a screen  $5.00 \text{ m}$  from the two slits.

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10 (a) Calculate the wavelength of light that will have the fifth order fringe at  $9.50 \text{ cm}$  from the center.  
(b) Calculate the slit separation.

$$d \sin \theta = m \lambda$$

$$\sin \theta \sim y/L$$

$$\frac{dy}{L} = m \lambda$$

$$\frac{dy_7}{L} = 7 \lambda_1 \Rightarrow d = \frac{7L \lambda_1}{y_7} = \boxed{2.04 \times 10^{-4} \text{ (m)}}$$

change  $\lambda_1 \leftrightarrow \lambda_2$

$$\frac{dy_5}{L} = 5 \lambda_2 \Rightarrow \lambda_2 = \frac{7}{5} \lambda_1 \left( \frac{y_5}{y_7} \right) = \frac{7}{5} \lambda_1 = \boxed{777 \text{ nm}}$$