

Week 16

Group: _____

1. (8 points) Two point sources of EM radiation are located $1.00 \mu\text{m}$ apart and emit the same wavelength in phase with one another. For what range of wavelengths is it possible to find a point in space where the two waves destructively interfere (i.e., 180° out of phase)? Express your answer as an inequality.

2. (12 points) An electromagnetic plane wave ($\lambda = 632.8 \text{ nm}$) is incident upon a double slit with slit separation $d = 0.20 \text{ mm}$. An interference pattern is observed on a screen $D = 1.00 \text{ m}$ away from the double slit.

a. (4 points) Determine the separation (Δy) between adjacent bright fringes for the first few bright fringes on the screen.

b. (4 points) What is the total number of bright fringes that can exist on the screen (assuming that the screen is large enough to accomodate them all). At what angle is the final fringe?

c. (4 points) Suppose a small dielectric substance with $n = 1.70$ and length $l = 2.00 \mu\text{m}$ is placed just before the second (bottom) slit. In what direction does the interference pattern shift, and by how many fringes?