Problem 1

A radio transmitting station operating at a frequency of 125 MHz has two identical antennas that radiate in phase. Antenna *B* is 8.95 m to the right of antenna *A*. Consider point *P* between the antennas and along the line connecting them, a horizontal distance *x* to the right of antenna *A*. What are the 3 lowest values of *x* where constructive interference occurs at point *P*?

Problem 2

Coherent light of frequency 6.38×10^{14} Hz passes through two thin slits and falls on a screen 83.0 cm away. You observe that the third bright fringe occurs at $\pm$ 3.14 cm on either side of the central bright fringe.
(a) How far apart are the two slits?
(b) At what distance from the central bright fringe will the third dark fringe occur?

Problem 3

Two slits spaced 0.450 mm apart are placed 75.0 cm from a screen. What is the distance between the second and third dark lines of the interference pattern on the screen when the slits are illuminated with coherent light with a wavelength of 500 nm?

Problem 4

Coherent light that contains two wavelengths, 660 nm (red) and 470 nm (blue), passes through two narrow slits separated by 0.300 mm, and the interference pattern is observed on a screen 5.00 m from the slits. What is the distance on the screen between the first-order bright fringes for the two wavelengths?

Problem 5

In a two-slit interference pattern, the intensity at the peak of the central maximum is I_0.
(a) At a point in the patternwhere the phase difference between the waves from the two slits is 60.0°, what is the intensity?
(b) What is the path difference for 480 nm light from the two slits at a point where the phase angle is 60.0°?

Problem 6

Coherent sources A and B emit electromagnetic waves with wavelength 2.00 cm. Point P is 4.86 m from A and 5.24 m from B. What is the phase difference at P between these two waves?

Problem 7

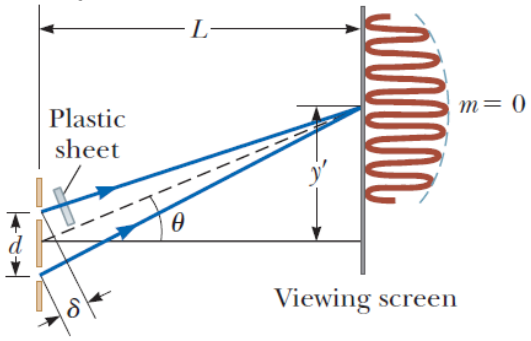
Two rectangular pieces of plane glass are laid one upon the other on a table. A thin strip of paper is placed between them at one edge so that a very thin wedge of air is formed. The plates are illuminated at normal incidence by 546 nm light from a mercury vapor lamp. Interference fringes are formed, with 15.0 fringes per centimeter. Find the angle of the wedge.

Problem 8

How far must the mirror M_2 of a Michelson interferometer be moved so that 1800 fringes of He-Ne laser light (λ = 633 nm) move across a line in the field of view?

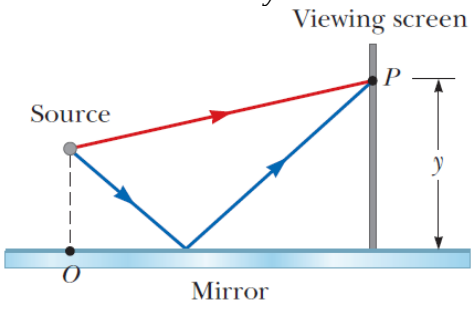
Problem 9

Consider the double-slit arrangement shown in the figure, where the slit separation is *d* and the distance from the slit to the screen is *L*. A sheet of transparent plastic having an index of refraction *n* and thickness *t* is placed over the upper slit. As a result, the central maximum of the interference pattern moves upward a distance *y*'. Determine the value of *y*'.



Problem 10

Interference effects are produced at point *P* on a screen as a result of direct rays from a 500-nm source and reflected rays from the mirror as shown in the figure. Assume the source is 100 m to the left of the screen and 1.00 cm above the mirror. Find the distance *y* to the first dark band above the mirror.



Problem 11

A lens made of glass (*ng* = 1.52) is coated with a thin film of MgF2 (*ns* = 1.38) of thickness *t*. Visible light is incident normally on the coated lens as shown in the figure. For what minimum value of *t* will the reflected light of wavelength 540 nm (in air) be missing?