PHYS 306 Spring 2010
Wave Motion and Electromagnetic Radiation

Homework Assignment

HW#6
Assignment Date: March. 16, 2010
Due Date: Mar. 23, 2010

1. Standing waves are formed on a stretched string under tension of 1 N. The length of the string is 30 cm, and it vibrates in three loops. If the mass per unit length of the string is 0.01 g/cm, calculate the angular frequency of the vibration?

Note: one loop of the standing wave is half the wavelength. For the calculation, you need to convert the units of the parameters to the same system, either MKS (SI) or cgs.

2. Standing waves with five loops are produced on a stretched string under tension. The length of the string is 50 cm, and the frequency of vibration is 250 Hz. The amplitude of the vibration at antinodes is 2 cm.
(1) Write down the equation of the standing wave. (No derivation of the standing wave is needed, referring to the book)
(2) Derive the displacement equation of the points which are at distance of 2, 5, 10, 15, 18, 30 cm from one end of the string.

3. In Young's double-hole experiment, the distance between the two holes is 0.5 mm, $\lambda = 5 \times 10^{-5}$ cm, and D = 50 cm. What will be the fringe width?

4. In the double-hole experiment using white light, consider two points on the projection screen, one corresponding to a path difference of 5000 Å (point A), and the other corresponding to a path difference of 40,000 Å (point B).
(1) Find all the wavelengths (in the visible region) which correspond to constructive and destructive interference at point A.
(2) Find all the wavelengths (in the visible region) which correspond to constructive and destructive interference at point B.