

Physics 102Rec
Quiz#1
Chapter 17

Name: Key Id: Sect: 03

Two waves traveling on a string are given by

$$y_1 = 0.015 \sin \pi(x/2 - 40t)$$

$$y_2 = 0.015 \sin \pi(x/2 + 40t)$$

where x and y are in meters and t in seconds.

(a) Write the equation for the resultant displacement of the two waves.

In general: $y'(x,t) = 2y_m \sin kx \cos \omega t$ (standing waves)

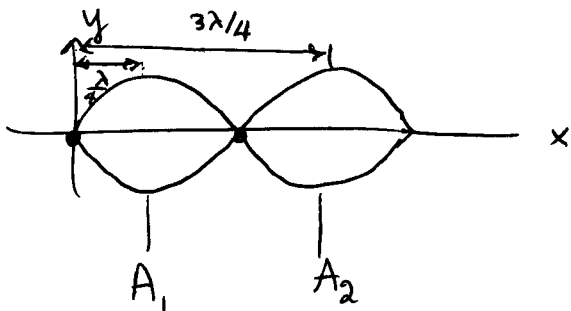
$$y_m = 0.015 \text{ m} ; \quad k = \frac{\pi}{2} \text{ m}^{-1} ; \quad \omega = 40\pi \text{ rad/s}$$

$$\Rightarrow \boxed{y'(x,t) = 0.03 \sin\left(\frac{\pi}{2}x\right) \cos(40\pi t)}$$

(b) What is the speed of the wave?

$$v = \frac{\omega}{k} = \frac{40\pi}{\frac{\pi}{2}} = 80 \text{ m/s}$$

(c) Find the two smallest values of x corresponding to antinodes.



For antinodes

$$\text{In general } x = n \frac{\lambda}{4} \quad n=1,3,5,\dots$$

$$A_1 \longrightarrow x_1 = \frac{\lambda}{4} = \boxed{1 \text{ m}}$$

$$\Leftarrow \lambda = \frac{2\pi}{k} = \frac{2\pi}{\frac{\pi}{2}} = 4 \text{ m}$$

$$A_2 \longrightarrow x_3 = \frac{3\lambda}{4} = \boxed{3 \text{ m}}$$