



Topic: WAVE MOTION

Name: _____

ID: _____ **Section:** _____

1. At $t = 0$, a transverse pulse in a wire is described by the function

$$y = \frac{6}{x^2 + 3}$$

where x and y are in meters. Write the function $y(x, t)$ that describes this pulse if it is traveling in the positive x direction with a speed of 4.50 m/s.

Ans (1):

2. Ocean waves with a crest-to-crest distance of 10.0 m can be described by the wave function

$$y(x, t) = (0.800 \text{ m}) \sin[0.628(x - vt)]$$

where $v = 1.20 \text{ m/s}$. (a) Sketch $y(x, t)$ at $t = 0$. (b) Sketch $y(x, t)$ at $t = 2.00 \text{ s}$. Note that the entire wave form has shifted 2.40 m in the positive x direction in this time interval.

Ans(2):									

3. A pulse moving along the x axis is described by

$$y(x, t) = 5.00e^{-(x+5.00t)^2}$$

where x is in meters and t is in seconds. Determine (a) the direction of the wave motion, and (b) the speed of the pulse.

Ans (3):

4. For a certain transverse wave, the distance between two successive crests is 1.20 m, and eight crests pass a given point along the direction of travel every 12.0 s. Calculate the wave speed.

Ans (4):

5 A sinusoidal wave on a string is described by

$$y = (0.51 \text{ cm}) \sin(kx - \omega t)$$

where $k = 3.10 \text{ rad/cm}$ and $\omega = 9.30 \text{ rad/s}$. How far does a wave crest move in 10.0 s? Does it move in the positive or negative x direction?

Ans (5):

6. A wave has an angular frequency of 110 rad/s and a wavelength of 1.80 m.

Calculate (a) the angular wave number and (b) the speed of the wave.

7. A sinusoidal wave moving along a string is shown twice in Fig. below, as crest A travels in the positive direction of an x axis by distance $d = 6.0$ cm in 4.0 ms. The tick marks along the axis are separated by 10 cm; height $H = 6.00$ mm.

If the wave equation is of the form $y(x, t) = A \sin(kx \pm \omega t)$,

What are (a) A (b) k , (c) v , and (d) the correct choice of sign in front of v ?

8. The equation of a transverse wave on a string is

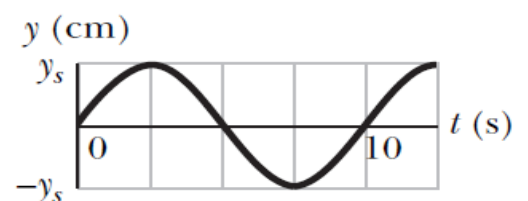
$$y = (2.0 \text{ mm}) \sin [(20 \text{ mm}^{-1}) x - (600 \text{ s}^{-1}) t]$$

The tension in the string is 15 N.

(a) What is the wave speed? (b) Find the linear density of this string in grams per meter.

9. A sinusoidal transverse wave of wavelength 20 cm travels along a string in the positive direction of an x axis. The displacement y of the string particle at $x = 0$ is given in Fig. below as a function of time t . The scale of the vertical axis is set by $y_s = 4.0$ cm. The wave equation is to be in the form $y(x, t) = A \sin(kx \pm \omega t + \phi)$,

- At $t = 0$, is a plot of y versus x in the shape of a positive sine function or a negative sine function?
- Calculate Amplitude (A),
- Angular wave number, Angular frequency & ϕ
- Correct sign in front of ω , and the speed of the wave?
- What is the transverse velocity of the particle at $x = 0$ when $t = 5.0$ s when $t = 5.0$ s?



10. A string is driven at a frequency of 5.00 Hz, the amplitude of motion is 12 cm and the wave speed is 20m/s. Determine (a) angular frequency and (b) wave number (c) write an expression for this wave and calculate (d) the **maximum** transverse speed and (e) the **maximum** transverse acceleration of a point on the string.