



Homework

1- A sinusoidal wave is described by

$$y = (0.25 \text{ m}) \sin(0.30x - 40t)$$

where x and y are in meters and t is in seconds. Determine for this wave the (a) amplitude, (b) angular frequency, (c) angular wave number, (d) wavelength, (e) wave speed, and (f) direction of motion.

① $y = 0.25 \sin(0.3x - 40t)$
 $y = A \sin(kx - \omega t)$ → to right

a) $A = 0.25 \text{ m}$, b) $\omega = 40 \text{ rad/s}$

c) $k = 0.3 \text{ rad/m}$

d) $k = \frac{2\pi}{\lambda} \rightarrow \lambda = \frac{2\pi}{k} = \frac{2\pi}{0.3} = 20.94 \text{ m}$

e) $v = \lambda f = \frac{\omega}{k} = \frac{40}{0.3} = 133.3 \text{ m/s}$

f) positive x -direction

2- Two waves in one string are described by the wave functions

$$y_1 = 3.0 \cos(4.0x - 1.6t)$$

and

$$y_2 = 4.0 \sin(5.0x - 2.0t)$$

where y and x are in centimeters and t is in seconds. Find the superposition of the waves $y_1 + y_2$ at the points (a) $x = 1.00$, $t = 1.00$, (b) $x = 1.00$, $t = 0.500$, and (c) $x = 0.500$, $t = 0$. (Remember that the arguments of the trigonometric functions are in radians.)

b) $x = 1$, $t = 0.5$

c) $x = 0.5$, $t = 0$

② $y_1 + y_2$

a) $x = 1 \text{ cm}$, $t = 1 \text{ s}$

$$y_{\text{resultant}} = y_1 + y_2$$

$$y_1 = 3 \cos(4(1) - 1.6(1)) = 3 \cos(2.4)$$

inside $\cos(\theta)$ → θ should be in degree

$$\text{so } 2.4 \times \frac{180}{\pi} = 137.5^\circ$$

$$y_1 = 3 \cos(137.5^\circ) = -2.21 \text{ cm}$$

$$y_2 = 4 \sin(5(1) - 2(1)) = 4 \sin(3) = 4 \sin(171.9^\circ) = 0.564 \text{ cm}$$

$$y_{\text{result}} = y_1 + y_2 = -2.21 + 0.564 = -1.65 \text{ cm}$$

$$y_1 = 3 \cos(4(1) - 1.6(0.5)) = 3 \cos(3.2) = 3 \cos(183.3^\circ) = -3 \text{ cm}$$

$$y_2 = 4 \sin(5(1) - 2(0.5)) = 4 \sin(4) = 4 \sin(229.2^\circ) = -3.03 \text{ cm}$$

$$y_{\text{result}} = -3 + (-3.03) = -6.03 \text{ cm}$$

$$y_1 = 3 \cos(4(0.5)) = 3 \cos(2) = 3 \cos(114.6^\circ) = -1.25 \text{ cm}$$

$$y_2 = 4 \sin(5(0.5)) = 4 \sin(2.5) = 4 \sin(143.2^\circ) = 2.39 \text{ cm}$$

$$y_{\text{result}} = -1.25 + 2.39 = 1.14 \text{ cm}$$