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Sect:

01

- (a) Write the expression for the displacement y as a function of x and t for a sinusoidal wave traveling along a rope in the negative x direction with the following characteristics; $y_{\max} = 8$ cm, $T = 2$ sec, $\lambda = 80$ cm, and $y(0,0) = 0$.

In general $y(x,t) = y_m \sin(kx + \omega t + \alpha)$

$$y_m = 8 \text{ cm} ; \quad k = \frac{2\pi}{\lambda} = \frac{2\pi}{0.8} = 2.5\pi \text{ m}^{-1} ; \quad \omega = \frac{2\pi}{T} = \frac{2\pi}{2} = \pi \text{ rad/s}$$

$$y(0,0) = y_m \sin \alpha = 0 \Rightarrow \sin \alpha = 0 \Rightarrow \alpha = 0$$

$$\Rightarrow \boxed{y(x,t) = (0.08 \text{ m}) \sin(2.5\pi x + \pi t)}$$

$$\text{or } y(x,t) = (0.08 \text{ m}) \sin(7.9 x + 3.14 t)$$

- (b) What is the speed of the wave?

$$v = \lambda f = \frac{\omega}{k} = \frac{\pi}{2.5\pi} = \boxed{0.4 \text{ m/s}}$$