

Test 2

PH 112

SHM

Traveling waves

Interference

Standing waves

Example #1

$$\omega = 8 \text{ rad/s}$$

$$x_0 = 4 \text{ cm} = 0.04 \text{ m}$$

$$v_0 = -25 \text{ cm/s} = -0.25 \text{ m/s}$$

$$A = ? \quad \phi_0 = ? \quad x(t) = ?$$

$$x(t) = A \cos(\omega t + \phi_0) \quad v(t) = -A \omega \sin(\omega t + \phi_0)$$

$$\phi_0 \Rightarrow .04 = A \cos(0 + \phi_0)$$

$$-.25 = -8A \sin(0 + \phi_0)$$

$$\frac{.25}{.04} = \frac{8 \sin \phi_0}{\cos \phi_0} = 8 \tan \phi_0 \quad \phi_0 = \tan^{-1}\left(\frac{6.25}{8}\right) = 0.66 \text{ rad}$$

$$.04 = A \cos(0.66) \quad A = \frac{.04}{\cos(0.66)} = 0.05 \text{ m}$$

$$x(t) = 0.05 \cos(8t + 0.66)$$

Example #2

$$D(x, t) = .03 \sin\left(\frac{2\pi}{2.4}x + 5t\right)$$

$$A = .03 \text{ m}$$

$$k = \frac{2\pi}{2.4} \text{ rad/m}$$

$$\omega = 5 \text{ rad/s}$$

Traveling in -x direction

$$k = \frac{2\pi}{\lambda} \quad \lambda = 2.4 \text{ m}$$

$$f = \frac{\omega}{2\pi} = \frac{5}{2\pi} = 0.8 \text{ Hz}$$