PHYS102.10
Quiz # 1

Name: Key Id#:

The speed of a travelling wave on a wire is 50 m/s. The wire is replaced by another wire with three times the linear density and twice as much tension as that of the first wire. What is the speed of the travelling wave on the new wire?

$$v_1 = \sqrt{\frac{\tau_1}{\mu_1}} = 50 \text{ m/s}$$

$$v_2 = \sqrt{\frac{\tau_2}{\mu_2}} = \sqrt{\frac{2\tau_1}{3\mu_1}} = \sqrt{\frac{2}{3}} \underbrace{\sqrt{\frac{\tau_1}{\mu_1}}}_{v_1}$$

$$v_2 = \sqrt{\frac{2}{3}} \times 50 = \boxed{40.8 \text{ m/s}}$$

Phys102.11
Quiz#1

Name: Key Id#:

A wave in a string, is given by the equation:

$$y(x,t) = 0.24*\sin(3.0*x-24*t),$$

where x and y are in meters and t is in seconds. Calculate the magnitude of the transverse speed at x = 2.0 m and t = 1.0 s.

Transverse SI

$$u(x,t) = \frac{dy}{dt} = -0.24 \times 24 \cos(3x - 24t)$$

$$u(2,1) = -0.24 \times 24 \cos(6 - 24)$$

$$= -5.76 \cos(-18) = -5.76 \times 0.66$$

$$= -3.8 \text{ m/s}$$

The speed = 3.8 m/s

Phys102.12
Quiz#1

Name: Key Id#:

A string that is stretched between fixed supports separated by 80.0 cm has resonant frequencies of 300 and 400 Hz, with no intermediate resonant frequencies. Find the wave speed.

$f_n = 300\ Hz$

$f_{n+1} = 400\ Hz$

$f_1 = f_{n+1} - f_n = 100\ Hz = \frac{v}{2L} = \frac{v}{2 \times 0.8} = \frac{v}{1.6}$

$\Rightarrow \boxed{v = 160\ m/s}$