Physics 102 Rec
Quiz#1
Chapter 17

Name: Key Id: Sect: 02

A string having of mass 10 g and length 2.0 m is under a tension of 80 N.

(a) How much power must be supplied to the rope to generate sinusoidal waves at a frequency of 60 Hz and an amplitude of 6.0 cm?

$$P = \frac{1}{2}\mu v \omega^2 y_m^2$$

$$\mu = \frac{m}{\ell} = \frac{10\times10^{-3}}{2} = 5\times10^{-3} \text{ kg/m}$$

$$2\pi f = 120\pi \text{ rad/s}$$

$$\sqrt{\frac{T}{\mu}} = \sqrt{\frac{80}{5\times10^{-3}}} = 126.5 \text{ m/s}$$

$$y_m = 6\times10^{-2} \text{ m}$$

$$P = \frac{1}{2}(5\times10^{-3})(126.5)(20\pi)^2(0.06)^2 = 161.8 \simeq 162 \text{ W}$$

(b) If the string's length is doubled, what would be the power delivered to the rope under the same experimental condtions as in part (a)?

If $\ell_2 = 2\ell_1$, μ will not change since it is the same material $\Rightarrow$ P remains the same.