Physics 103 Quiz # 9, Thursday (3/28/2013) *Key*
Show all work in order to obtain points for problems
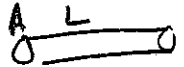
Name:_____

1. (2 pts)   If a radio wave has speed 3.00×10^8 m/s and frequency 94.7 MHz, what is its
    wavelength?

    a. 8.78 m
    b. 1.20 m
    c. 2.50 m
    (d.) 3.17 m

$V = \lambda f \qquad \lambda = \dfrac{V}{f} = \dfrac{3.00 \times 10^8}{94.7 \times 10^6}$

$= 3.17\, m$

M

2. (4 pts.) Transverse waves travel with a speed of 200 m/s along a taut copper wire that has a
   diameter of 1.50 mm. What is the tension in the wire? (The density of copper is 8.93 g/cm^3.)

   a. 1 890 N
   b. 1 260 N
   (c.) 631 N
   d. 315 N

$\mu = \rho A = \rho \pi \left(\tfrac{d}{2}\right)^2$

$= 8930 kg/m^3 \, \pi \left(\dfrac{1.5 \times 10^{-3}}{2} m\right)^2$

$\cdot = 0.0157\, kg/m$

$V = \sqrt{\dfrac{T}{\mu}}$

$T = V^2 \mu$

$= (200\, m/s)^2 (0.0157\, kg/m) = 631\, N$

$M = (L\, A)\rho$

$M = \dfrac{M}{L}$

$\mu = A\rho$

3. (2 pts.) A 100-m-long high-voltage cable is suspended between two towers. The mass of the
   100-m cable is 150 kg. If the tension in the cable is 30 000 N, what is the lowest frequency at
   which this cable can oscillate?

   (a.) 0.71 Hz
   b. 1.0 Hz
   c. 1.4 Hz
   d. 2.0 Hz

$f = \dfrac{n}{2L} \sqrt{\dfrac{T}{\mu}}$

$f_0 = \dfrac{1}{2L} \sqrt{\dfrac{T}{\mu}}$

$= \dfrac{1}{2(100)} \sqrt{\dfrac{30,000 N}{(150 kg/100)}}$

$= 0.707\, Hz$