Practical 8 Questions

1. An undersea earthquake or a landslide can produce an ocean wave of short duration carrying great energy, called a tsunami. When its wavelength is large compared to the ocean depth, d, the speed of a water wave is given approximately by $v = \sqrt{gd}$. Assume an earthquake occurs all along a tectonic plate boundary running north to south and produces a straight tsunami wave crest moving everywhere to the west.

(a) What physical quantity can you consider to be constant in the motion of any one wave crest?

(b) Explain why the amplitude of the wave increases as the wave approaches shore.

(c) If the wave has amplitude 1.80 m when its speed is 200 m/s, what will be its ampllitude where the water is 9.00 m deep?

2. A wave travels along a string in the positive x-direction at 30.0 m/s. The frequency of the wave is 50.0 Hz. At x = 0 and t = 0, the wave velocity is 2.50 m/s and the vertical displacement is y = 4.00 mm. Write the function y(x,t) for the wave.

3. A steel wire, of length $l_1 = 60.0$ cm, cross-sectional area $1.00 \times 10^{-2}\text{cm}^2$, and density 7.80g/cm^3, is joined to a thicker steel wire of cross-sectional area $3.00 \times 10^{-2}\text{cm}^2$. The compound wire, loaded with a block of mass $m = 10.0$ kg, is arranged as in the figure so that the distance l_2 from the joint to the supporting pulley is 92.4 cm. Transverse waves are set up in the wire by using an oscillator of variable frequency; this sets up an antinode at the oscillator end of the wire, and a node at the pulley. What is the lowest frequency of oscillator to sustain a standing wave such that the joint in the wire is a node?