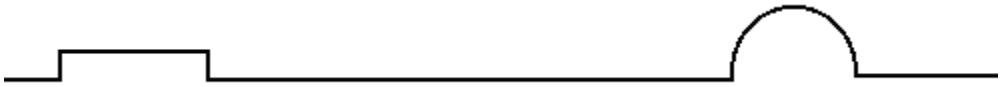
DAY 17 -- Homework

1. The two pulses in the figure below are moving toward one another. Make a sequence of sketches showing the two waves meeting, passing through one another, and leaving one another.

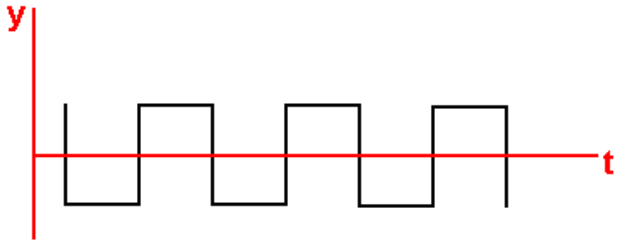


2. Both longitudinal and transverse waves can travel through solids, but only longitudinal waves can travel through fluids. Explain.

3. y(x,t) = 10 cm sin (x – 100 t). Determine the amplitude, period, frequency, wavelength, and speed of this wave.

4. f(x,t) = 10 cm sin (x – 100 t)
   g(x,t) = 10 cm sin (2x – 100 t)
   Sketch the wave form that results from f(x,t) + g(x,t).

5. A square wave has a waveform as shown. In this plot x = 0 (we are only looking at oscillations in time). Mathematicians will tell you that a square wave function can be formed by adding a sine wave of frequency f and amplitude A plus a sine wave of frequency 3f and amplitude A/3 plus a sine wave of frequency 5f and amplitude A/5, etc. A true square wave results in from the infinite sum of this sequence. Put in math speak, this is



$$y_{square}(x=0,t)=\sum_{i=0}^{\infty}\frac{A}{2i+1}\sin\left(2\pi(2i+1)ft\right)$$

   Try this out in EXCEL. Use f = 60 Hz, A = 5 cm. Make a column for

   y(0,t) = 5 cm sin [2π 10 t]

   and then a column for

   y(0,t) = (5/3 cm) sin [2π (3*10) t]

   and so forth. Sum these up to produce your synthesized square wave and make a plot of the synthesized wave. Make plots for various qualities of synthesized wave.