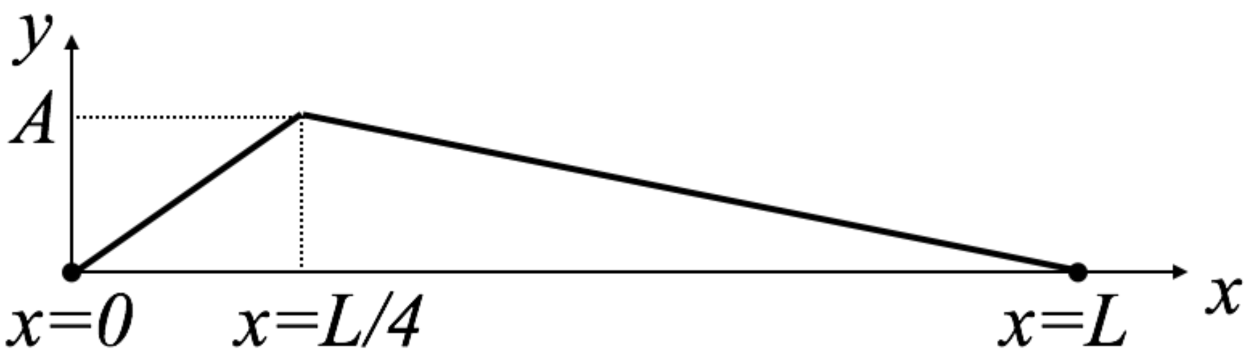
PHYS2063 Wave Physics Fall 2017 HW #7 Due 20 Oct 2017

This assignment has only one problem, but it will count double.

A string with linear mass density μ under tension T and of length L lies along the x-axis. One end is fixed at $x = 0$ and the other end is fixed at $x = L$. The string is "plucked" by pulling it up a distance $A \ll L$ at the point $x = L/4$ as shown here:



(a) Find the first five nonzero Fourier components. Add them up and compare the curve to the initial shape $y_0(x)$ shown above.

(b) Find the shape of the string at times $t = T/4$, $T/2$, and $3T/4$, where $T = 2\pi/\omega_1$ is the period corresponding to the fundamental frequency.

(c) Of course, you are looking at an approximation because you've truncated the Fourier expansion at five terms. What do you think the actual shape looks like as the string oscillates? If you did this in Mathematica, you can use the functions "Table" and "Total" to include an arbitrarily large number of terms in the expansion.

If you're ambitious, try making a Mathematica animation of the motion.