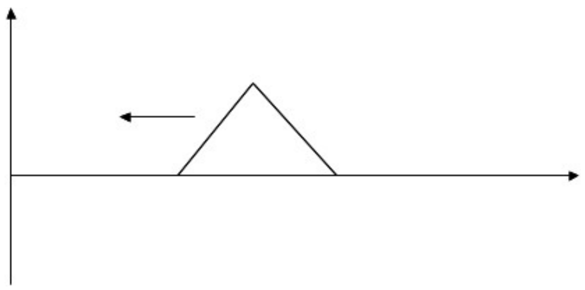
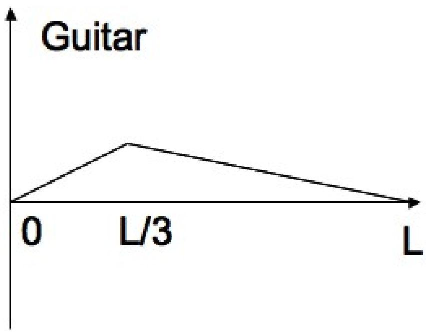
Acoustics Exercise 2. To be returned on Monday 30.3.2009

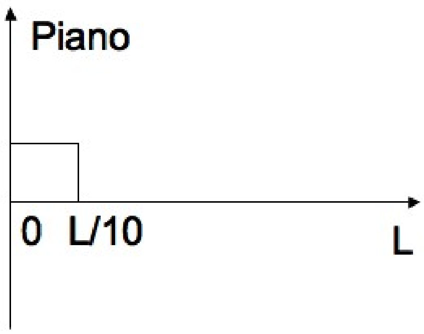
Notice, no lecture on Friday 27.3 due to travel!

(1) Consider an infinite string fixed at origin ($y(0.t) = 0$). A pulse $f(x + ct)$ is approaching from the right to the origin. How does the pulse evolve in time? Howabout for sting that is free at origin, $\left.\frac{\partial y(x,t)}{\partial x}\right|_{x=0}) = 0$?



(2) Let us fix the string at both ends $x = 0$, and $x = L$. (a) Solve spectrum of the string,when it is plucked by a player from $x = \frac{1}{3}$. Then the deformation at zero time is a triangle, and initial speed is zero everywhere. (b) Solve the spectrum, when it is hit by an uniform piano hammer at $x = 0$ to $x = L/10$. The initial deformation is zero, and the initial velocity a step function.





(3) Solve the eigenmodes and resonances of a rectangular membrane, fixed at the perimeter. The sides of the rectangle are a and b. Give an estimate of the density of modes at high frequencies.

(4) Solve the axial (depend only on radial coordinate) eigenmodes and resonances of a circular drum with radius a. The membrane is fixed at the perimeter. Hint: Use the literature to figure out the zeros of the Bessel functions...