Physics 422 - Spring 2013 - Assignment #6, Due February 22$^{\text{st}}$

1. (*French, 6-14*) Find the Fourier series for the following functions
$(0 \leq x \leq L)$:

(a) $y(x) = Ax(L - x)$
(b) $y(x) = A \sin(\pi x / L)$
(c) $y(x) = \begin{cases} A \sin(2\pi x / L) & 0 \leq x \leq L/2 \\ 0 & L/2 \leq x \leq L \end{cases}$

2. (*French 6-15*) Find the Fourier series for the motion of a string of length L if
(a) $y(x, 0) = Ax(L - x)$ and $(\partial y / \partial t)_{t=0} = 0$.
(b) $y(x, 0) = 0$ and $(\partial y / \partial t)_{t=0} = Bx(L - x)$.

3. (*French 7-6*) It is observed that a pulse requires 0.1 sec to travel from one end to the other of a long string. The tension in the string is provided by passing the string over a pulley to a weight which has 100 times the mass of the string.

(a)   What is the length of the string?
(b)   What is the equation of the third normal mode?