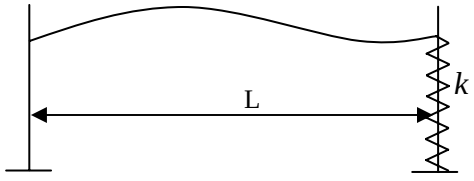
Princeton University **Physics 203** **Fall 2006**

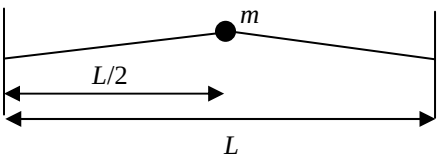
Problem Set 7 due Wednesday, November 27 at 9 AM (no late homeworks)

1. Problem 13.4

2. A string of mass density λ and length L is stretched with tension τ. One end of the string is fixed, while the other is attached to a massless spring with a spring constant k as shown in the figure. Determine the boundary condition at the spring and find the equation for frequencies of the normal modes. Consider the limits of $k \to 0$ and $k \to \infty$



3. A string of length L and mass density λ is stretched between two fixed walls with tension τ. A small mass m is attached to the center of the string. By applying appropriate boundary conditions at the location of the mass find the equation that determines possible oscillation frequencies of the string. Sketch or plot the equation to identify its solutions.



4. A series of masses m are connected by springs with spring constant k and equilibrium separation d. Write down the equation of motion for mass m_j and derive the wave equation for compression waves. Take the continuum limit to determine the velocity of longitudinal sound waves in a long metal rod with density ρ and Young's module E.