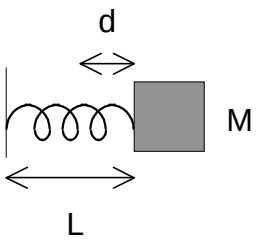
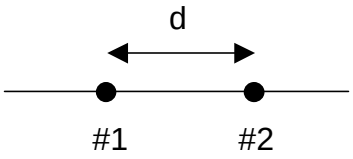
SAMPLE FIRST MIDTERM

Problem 1. A block of mass M is connected to a spring with spring constant k and relaxed length L. The block/spring is compressed a distance d and released. Neglect gravity. Use: M = 8.0 kg, k = 2.0 N/m, L = 0.10 m, d = 0.020 m.



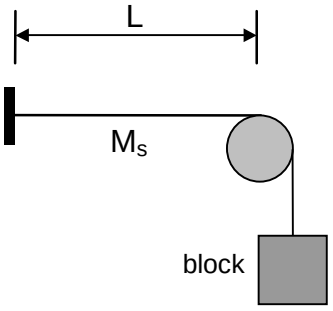
(a) What is the maximum distance the block obtains from the wall?
(b) How long does it take to first reach the maximum distance from the wall starting from the initial position?

Problem 2. A transverse wave, amplitude A and frequency f, propagates on a string to the right. You observe that, at some instant in time, two points on the string a distance d apart have a phase difference of $\Delta\phi$.
Use: A = 10 cm, f = 40 Hz, d = 5 cm, $\Delta\phi = \pi/6$.



(a) What is the wavelength of the wave?
(b) If point #1 has height 2.0 cm at some time, what are the possible heights of point #2?

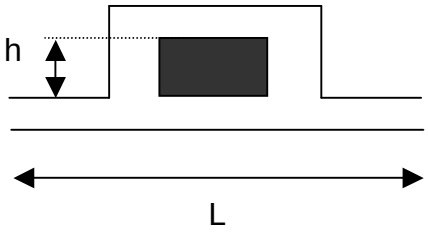
Problem 3. A string is secured to a wall at one end and pulled on by a block from the other. The section of string between the wall and pulley has length, L, and mass, M_s. This section is oscillating transversely in its fourth harmonic at a frequency, f, with a node at the pulley.



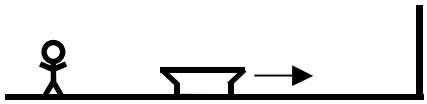
(a) What is the wave speed?
(b) What is the mass of the block?

SAMPLE FIRST MIDTERM

Problem 4. A sound wave, frequency f, enters the left hand side of the arrangement of pipes shown. What are the two smallest values of h so that the sound intensity at the right end will be a minimum? Use: f = 1200 Hz, L = 10 m.



Problem 5. A speaker is between you and a wall. The speaker is emitting a sound wave at frequency f and is moving towards the wall at speed v_o.



There will be a beat between the sound from the speaker going directly to you and the sound reaching you after bouncing off the wall. What is the beat frequency? [Use "v" to represent the speed of sound.]