Chapter 16
Example Problems

1. A block whose mass is 680 g is fastened to a spring whose spring constant is 65 N/m. The block is pulled a distance x = 11 cm from its equilibrium position at x = 0 on a frictionless surface and released from rest at t = 0.
   a. What are the angular frequency, the frequency, and the period of the resulting motion?
   b. What is the amplitude of the oscillation?
   c. What is the maximum speed of the oscillating block, and where is the block when it has this speed?
   d. What is the magnitude of the maximum acceleration of the block?
   e. What is the velocity function $v(t)$ for the spring-block system?
   f. What is the acceleration function $a(t)$ for the spring-block system?

2. Many tall building have mass dampers, which are anti-sway devices to prevent them from oscillating in a wind. The device might be a block oscillating at the end of a spring and on a lubricated track. If the building sways, say eastward, the block also moves eastward but delayed enough so that when it finally moves, the building is then moving back westward. Thus, the motion of the oscillator is out of step with the motion of the building. Suppose that the block has mass $m = 2.72 \times 10^5$ kg and is designed to oscillate at frequency f = 10.0 Hz and with amplitude x_m = 20.0 cm. What is the total mechanical energy of the spring-block system?

3. A standing wave is set-up on a string of length L = 6.0 m such that frequency of 250 Hz corresponds to the 3rd harmonic.
   a. Draw a picture of the standing wave pattern and label the wavelength, amplitude, nodes, and antinodes.
   b. Calculate the wavelength for these waves and the velocity of the wave on the string.
   c. Calculate the frequency that corresponds to the 1st and 6th harmonics.