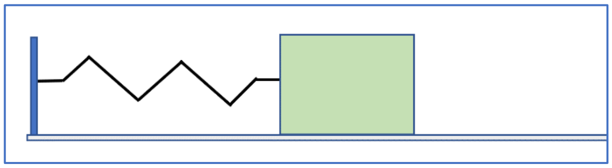
ENGR 110 PAL Worksheet #12

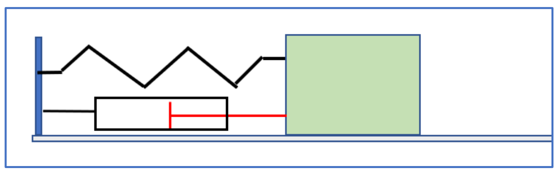
Oscillations (use g = 32.2 ft/s^2 m = 9.81/s^2)

1. The surface is smooth so friction is negligible. The mass is 10 kg and the spring has stiffness 1000 N/m. The mass is pulled to the right 50 centimeters and released from rest. Determine



a) the spring/mass system natural frequency
b) the period of the spring/mass system oscillation
c) the amplitude of the spring/mass system oscillation
d) the maximum speed reached by the mass. One way to get this is to use $KE_2 + PE_2 = KE_1 + PE_1$.

2. A viscous damper with damping coefficient 60 N*sec/m is added the system. Once again, the mass is pulled to the right 50 centimeters and released from rest.



Determine the system's
a) damping ratio
b) damped natural frequency
c) period in seconds per cycle

Is the system overdamped, underdamped or critically damped?

3. On the same set of axes graph
a) at least 3 cycles of position versus time of the mass in problem 1
b) at least 2 cycles of position versus time for the mass in problem 2

For the damped oscillation, write and use equation 8/12 if time permits.

4. Suppose that while the system in problem 5 is oscillating, energy is added periodically by a forcing function (such as a periodic push to the mass). Determine the oscillation magnification factor M if the energy is added
a) once every 6 seconds and b) once every 0.65 seconds.