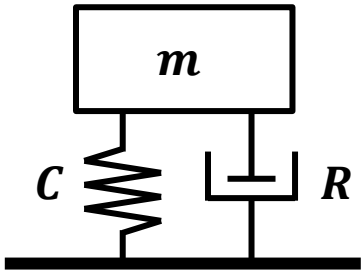
Homework Assignment:

1. Redo HW1 problem 1 using the LaGrange Method.

2. Draw the impedance circuit for the mass-spring system:



   a. Solve for the mechanical admittance (v/F) of the system above. Admittance, Y, is the reciprocal of impedance, and is a measure of how easily a device will allow current (or velocity) to flow.

   b. Using the values m = 0.5 kg, C = 1.2665e-6 m/N, and R = 10 Nm/s, write a Matlab script to calculate and plot the magnitude and phase of the admittance for frequencies between 10 and 1000 Hz. Describe what you see in this plot and what you think it might represent.

      Note: To plot, use the semilogx( ) function to create a logarithmic x axis. Use abs(Y) in Matlab to calculate the magnitude of a complex number and angle(Y) to calculate the phase. Typically, we plot the magnitude on a decibel scale (20*log10(abs(Y)).

   c. Using the LaPlace techniques in Matlab, plot $v(t)$ and $x(t)$ given $x_0 = 0.3\,m$ and $v_0 = 1\,m/s$.

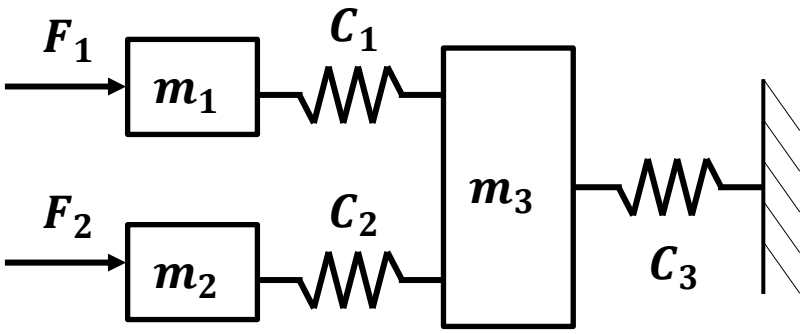
   d. Next, instead of treating R as a single constant, set up R as a vector with different values (some smaller, some larger). Provide plots for $Y(\omega)$, $v(t)$, and $x(t)$ with the different values of R. (*Hint: Use a for loop.)* What is the effect of varying R?

   e. Repeat part (d), but vary C instead of R. What is the effect of varying C?

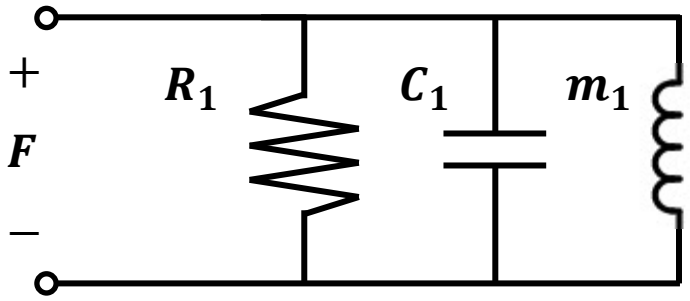
Homework Assignment:

3. Draw the equivalent circuits or systems of the following, and derive the admittance matrices:

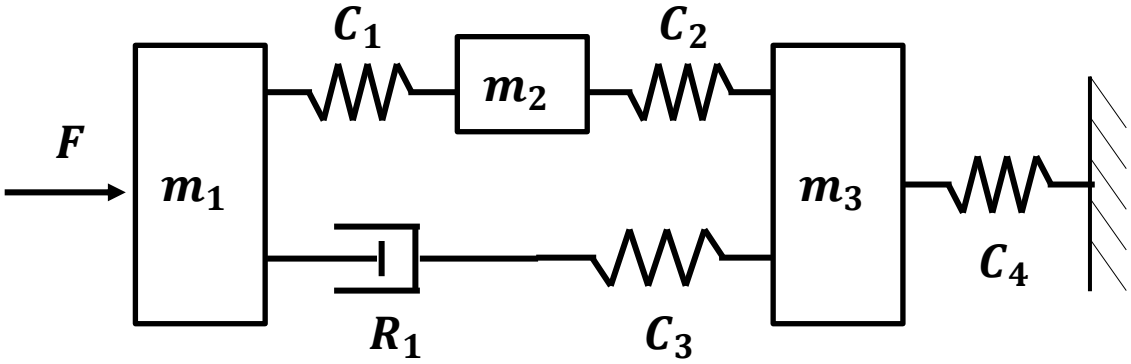
a.



b.



c.



Homework Assignment:

4. For the system below, construct the equivalent circuit using transformers, and then as one circuit. Using both loop analysis and the LaGrange equations, determine the admittance matrix, **Y**.