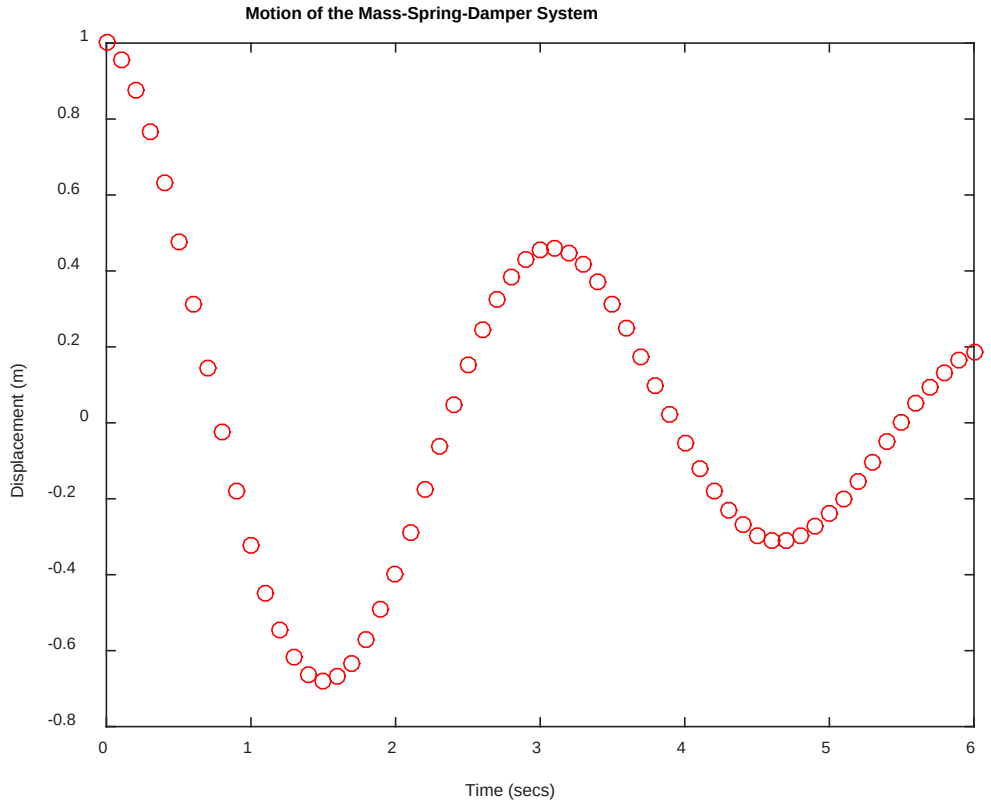
EXAM 1 – COMPUTER PORTION

Put all of your code in one script and name it `lastname_firstname.m` (all lower case). Include your name, section number, and CM number in the header section of your code. **There should be no output other than what is requested**.

Problem (50 pts)

For this exam problem, we will work with the Excel file `Mass_Spring_Damper.xls` posted on the course website. The file contains displacement data for the oscillatory response of a system. Time (in seconds) is recorded in the first row, and the second column contains the system's displacement in meters.

a) (15 points) Download the Excel file from the course website. Load the contents of the file into MATLAB. **Do not** hard code the dimensions of the loaded array. Plot the displacement data over time using **red circles**. Add good axis labels and a title. When finished, your figure should look like the one shown below.



(over)

b) (20 points) Add code to your script to estimate the velocity of the mass from the displacement data. The velocity may be estimated as

$$v_{i+1} = \frac{x_{i+1} - x_i}{t_{i+1} - t_i}$$

Make a new figure and plot the velocity of the mass as a function of time. Use good axis labels and a good title.

c) (15 points) We will now find the potential energy of the spring and the kinetic energy of the mass as functions of time. Recall that

$$potential\ energy = \frac{1}{2}\, k\, x^2$$

and that

$$kinetic\ energy = \frac{1}{2}\, m\, v^2$$

Use k= 2 *N/m* and m = 0.5 *kg*. Create a new figure and plot both curves on a single graph. Add a legend, good axis labels, and a good title. (The units of energy will be *N-m*.)

When you are finished, put your script (`lastname_firstname.m`) in the Moodle assignment dropbox.

NOTE: All programming must stop 5 minutes before the end of the period. You will have 5 minutes after that to post your file to Moodle if you need that time.