ENGR15100: SOFTWARE TOOLS FOR ENGINEERS

Laboratory 5

PURPOSE: Learn more about plotting routines.

For each problem, create a MATLAB script file and name it FIRSTNAME_LASTNAME_LAB5.m. Put ALL the commands for the required steps in your script file:

- Be sure to clear the display and the memory.
- Display your name.
- Separate and label different steps using comments.
- For each plot question, you can use pause and close functions to stop and check the plots, and then close the figure window.

You can use following template for each of the Problem.

```
%{
Class        : ENGR15100: Software Tools for Engineers
Instructor   : Xiaoli Yang
Author       : [Student's Name]
Assignment   : Lab [No.]
File Name    : Firstname_Lastname_LAB[No.]_Problem[No.].m
               (eg: Xiaoli_Yang_LAB1_Problem1.m)
Date         : [MM]/[DD]/[YY]
%}

%clear screen
clc

%clear workspace
clear

%display your name
disp('Your Full Name Here');
disp('Starting code: ');

%Start your source code here%

%End your code
disp('Completed');
```

SUBMITTING YOUR LAB:

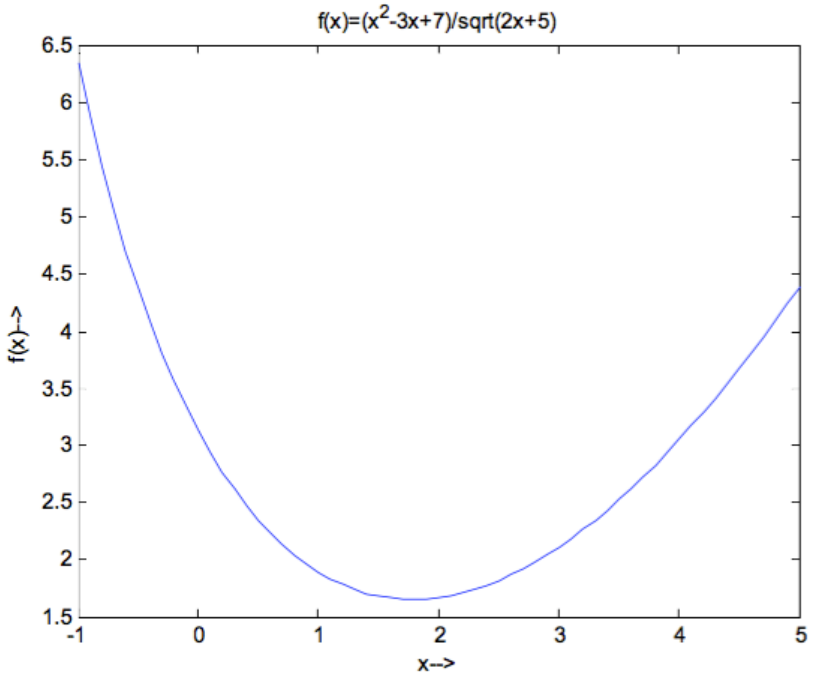
Submit your lab by uploading .m file using the Brightspace Assignment feature no later than the date specified.

PROBLEM 1 (10 points)

- Create the following two data vectors:
  area = .009 .021 .063 .402 .523 1.008 3.310 7.290 20.520
  res = 2000 1012 364 110 46 20 8 3.5 1.2
- Make a linear plot with area on the x-axis and res on the y-axis. Call this Figure 1. Add labels of "CONDUCTOR AREA" for the x-axis, "WIRE RESISTANCE" for the y-axis, and a title of "Wire Resistance versus Conductor Area."
- For Figure 2, repeat the above with a log-log plot.

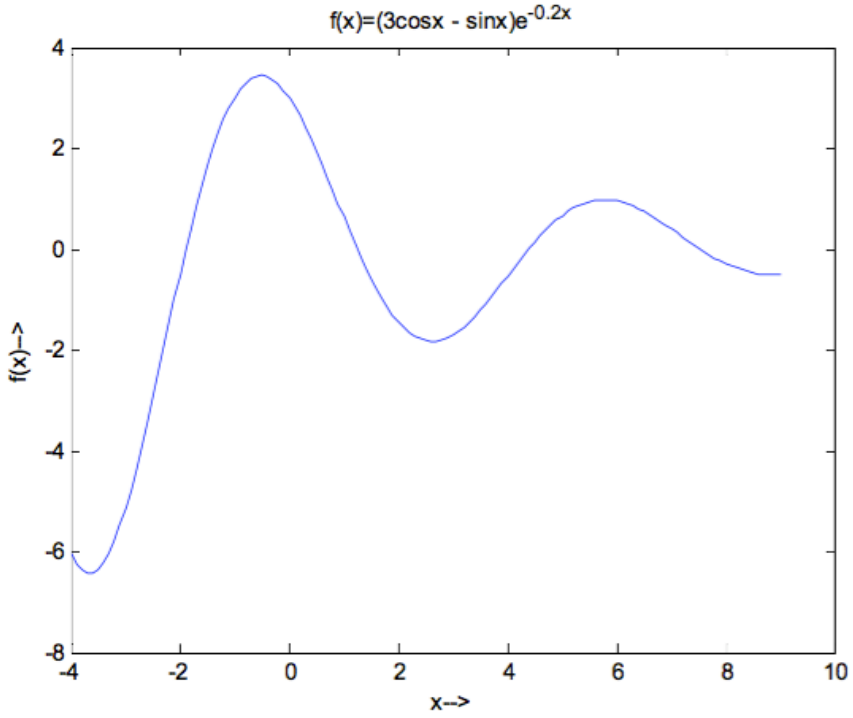
PROBLEM 2 (10 points)

Plot the function $f(x) = \frac{x^2-3x+7}{\sqrt{2x+5}}$ for $-1 \leq x \leq 5$. Add appropriate plot title and label the axes. After completing this step, you should obtain a plot in the Figure Window similar to the sample plot shown below:



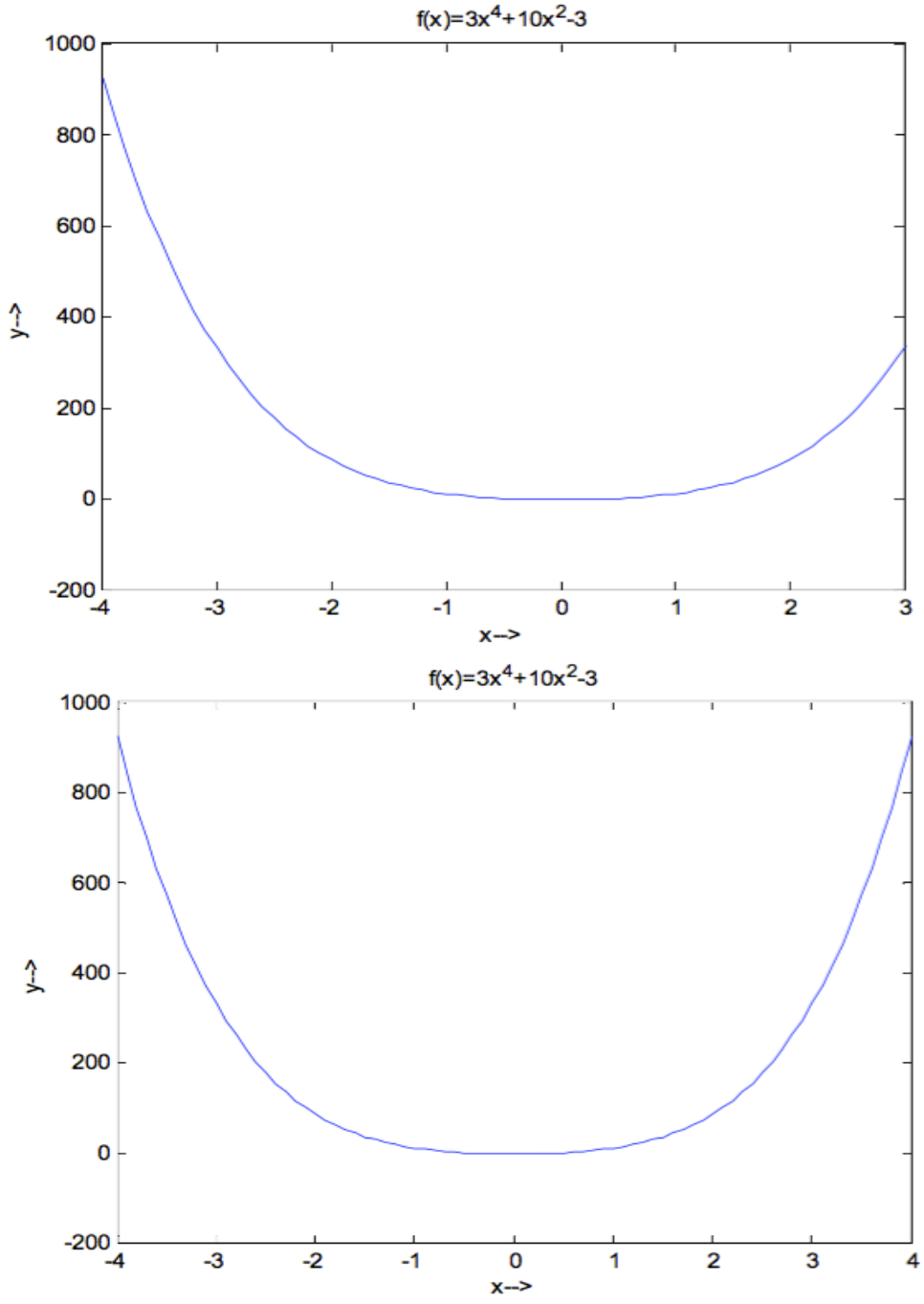
PROBLEM 3 (10 points)

Plot the function $f(x) = (3cosx - sinx)e^{-0.2x}$ for $-4 \leq x \leq 9$. Add appropriate plot title and label the axes. After completing this step, you should obtain a plot in the Figure Window similar to the sample plot shown below:



PROBLEM 4 (10 points)

Make two separate plots of the function $f(x) = 3x^4 + 10x^2 - 3$, one plot for $-4 \leq x \leq 3$ and one for $-4 \leq x \leq 4$. Add appropriate plot title and label the axes. After completing this step, you should obtain two plots in the two Figure Windows, respectively, similar to the sample plots shown below:



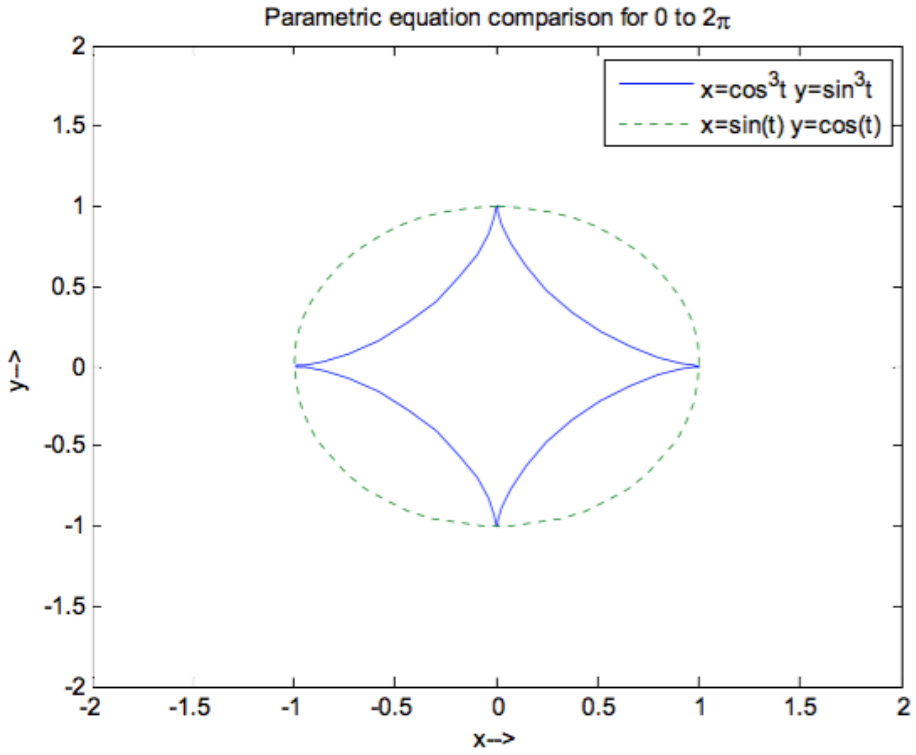
PROBLEM 5 (10 points)

Two parametric equations are given by:

$$x = cos^3(t), y = sin^3(t)$$
$$u = sin(t), v = cos(t)$$

In one figure, make plots of y versus x and v versus u for $0 \leq t \leq 2\pi$. Format the plot such that the both axes will range from -2 to 2. Add appropriate plot title and legend, and label the axes.

After completing this step, you should obtain two plots in a single Figure Window similar to the sample plots shown below:



PROBLEM 6 (10 points)

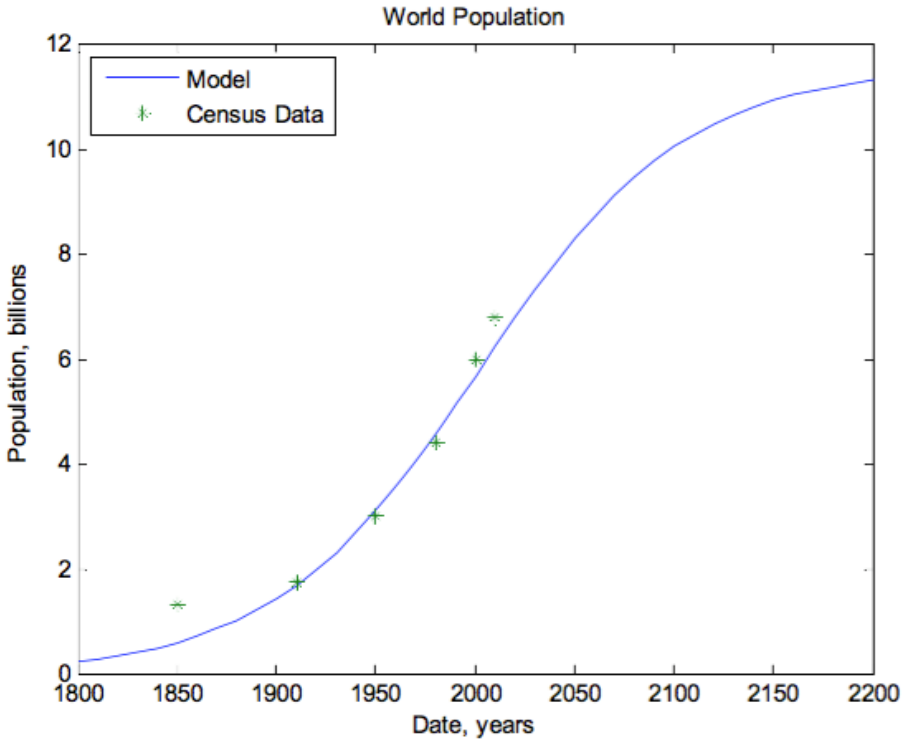
The following data gives the approximate population of the world for selected years from 1850 until 2000.

Year	1850	1910	1950	1980	2000	2010
Population (billions)	1.3	1.75	3	4.4	6	6.8

The population, P, since 1900 can be modeled by the logistic function:

$$P = \frac{11.55}{1 + 18.7e^{-0.0193(t-1850)}}$$

where P is in billions and t is years since 1850. Make a plot of population versus years. The figure should show the information from the table above as data points and the population modeled by the equation as a solid line. Set the range of the horizontal axis from 1800 to 2200. Add a plot title and a legend, and label the axes.
After completing this step, you should obtain two plots in a single Figure Window similar to the sample plots shown below:



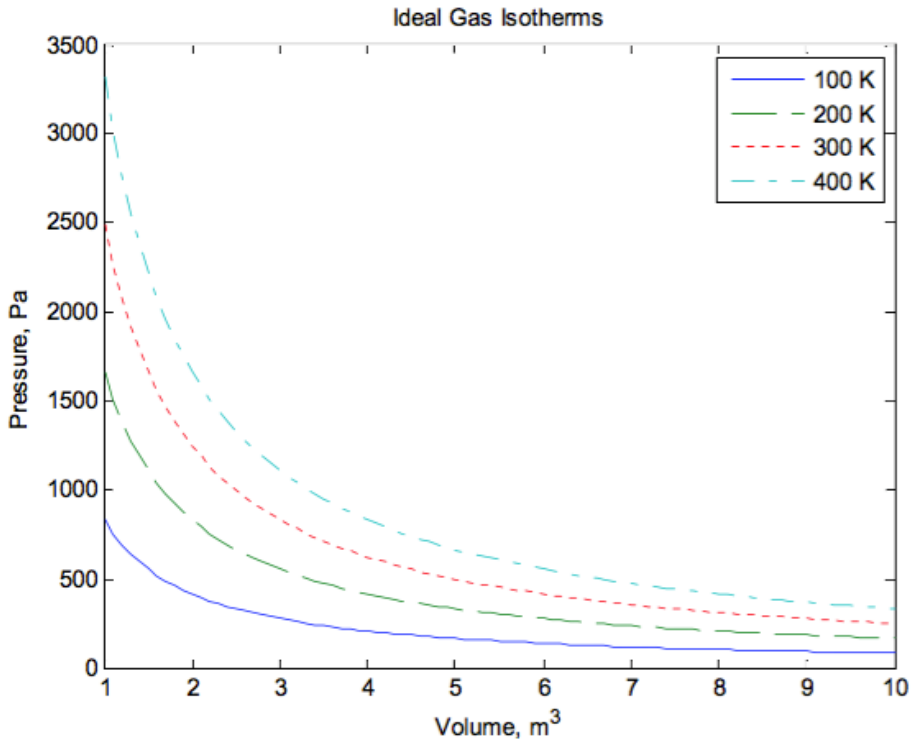
PROBLEM 7 (20 points)

The ideal gas law relates the pressure P, volume V, and temperature T of an ideal gas:

$$PV = nRT$$

where n is the number of moles and $R = 8.3145\ J/(K\ mol)$. Plots of pressure versus volume at constant temperature are called isotherms. Plot the isotherms for one mole of an ideal gas for volume ranging from 1 to $10\ m^3$, at temperatures of $T = 100, 200, 300, and\ 400\ K$ (four curves in one plot). Label the axes and display a title and a legend. The units for pressure are Pa.

After completing this step, you should obtain four plots in a single Figure Window similar to the sample plots shown below:



PROBLEM 8 (20 points)

Make a plot of a circle with its center at (4.2, 2.7) and radius of 7.5. Add appropriate plot title and label the axes. After completing this step, you should obtain a circle in a single Figure Window similar to the sample plots shown below:
(Note that there are blue and green colored lines indicate two separate sections of the circle)