Assignment 6 ENGR 220

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Problem 1

Create vector X as all the integers from 1 to 15. Create vector Y with 15 evenly spaced entries beginning with 2 and ending with 24. Establish variable Z = 12.

```
% Problem 1 Setup Variables
clc;

x = (1:15);
y = linspace(2, 24, 15);
z = 12;
```

Problem 1a

Find vector D = X +Y

```
d = x + y;
fprintf("\nVector d:\n");
disp(d);
```

```
Vector d:
  Columns 1 through 7

    3.0000    5.5714    8.1429   10.7143   13.2857   15.8571   18.4286

  Columns 8 through 14

   21.0000   23.5714   26.1429   28.7143   31.2857   33.8571   36.4286

  Column 15

   39.0000
```

Problem 1b

Find vector Q that has 15 entries composed of the first element of X multiplied by the first element of Y, the second element of X multiplied by the second element of Y, etc.

```
q = x .* y;
fprintf("\nVector q:\n");
disp(q);
```

```
Vector q:
  Columns 1 through 7

    2.0000    7.1429   15.4286   26.8571   41.4286   59.1429   80.0000

  Columns 8 through 14

  104.0000  131.1429  161.4286  194.8571  231.4286  271.1429  314.0000

  Column 15

  360.0000
```

Problem 1c

Find vector A that is Z divided by each of the elements of Y.

```
a = y ./ z;
fprintf("\nArray a:\n");
disp(a);
```

```
Array a:
  Columns 1 through 7

    0.1667    0.2976    0.4286    0.5595    0.6905    0.8214    0.9524

  Columns 8 through 14

    1.0833    1.2143    1.3452    1.4762    1.6071    1.7381    1.8690

  Column 15

    2.0000
```

Problem 1d

Create array B with the first column equal to X, the second column equal to A and the third column equal to Y.

```
b = [x', a', y'];
fprintf("\nArray b:\n");
disp(b);
```

```
Array b:
    1.0000    0.1667    2.0000
    2.0000    0.2976    3.5714
    3.0000    0.4286    5.1429
    4.0000    0.5595    6.7143
    5.0000    0.6905    8.2857
    6.0000    0.8214    9.8571
    7.0000    0.9524   11.4286
    8.0000    1.0833   13.0000
    9.0000    1.2143   14.5714
   10.0000    1.3452   16.1429
   11.0000    1.4762   17.7143
   12.0000    1.6071   19.2857
   13.0000    1.7381   20.8571
   14.0000    1.8690   22.4286
   15.0000    2.0000   24.0000
```

Problem 1e

Create array C that has the third through sixth rows of B and all the columns.

```
c = b(3:6, :);
fprintf("\nArray c:\n");
disp(c);
```

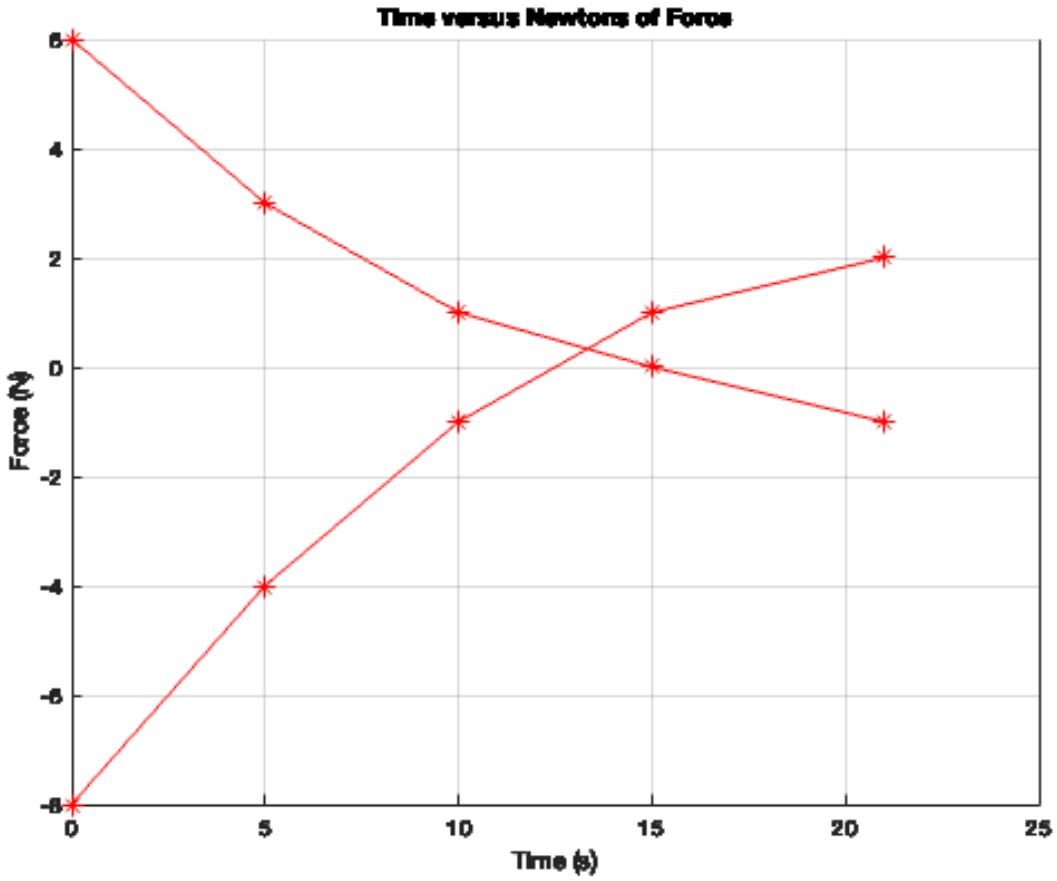
```
Array c:
    3.0000    0.4286    5.1429
    4.0000    0.5595    6.7143
    5.0000    0.6905    8.2857
    6.0000    0.8214    9.8571
```

Problem 2

Plot columns 2 and 3 of the following matrix A versus column 1. The data in column 1 is time (seconds). The data in columns 2 and 3 are forces (Newtons).

```
% Plot Data
problem2Matrix = [[0 ,-8, 6]; [5, -4, 3]; [10, -1, 1]; [15, 1, 0]; [21, 2,
 -1]];

figure(21);
problem2Plot = axes();
hold(problem2Plot,'on');
```

```
plot(problem2Matrix(:,1), problem2Matrix(:,2:3),'*-r','Parent',problem2Plot);
grid on;

% Create title
title({'Time versus Newtons of Force'});

% Create ylabel
ylabel({'Force (N)'});

% Create xlabel
xlabel({'Time (s)'});

% Set the remaining axes properties
hold(problem2Plot,'off');
```



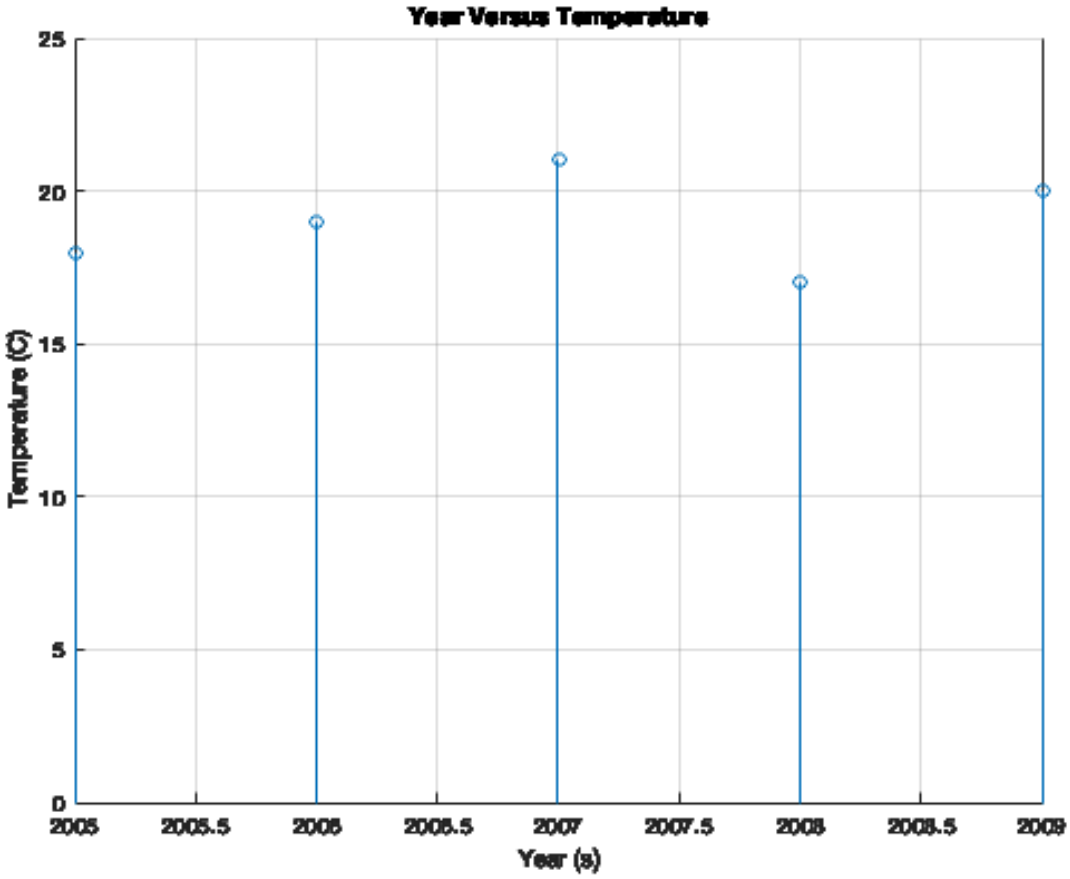
Problem 3

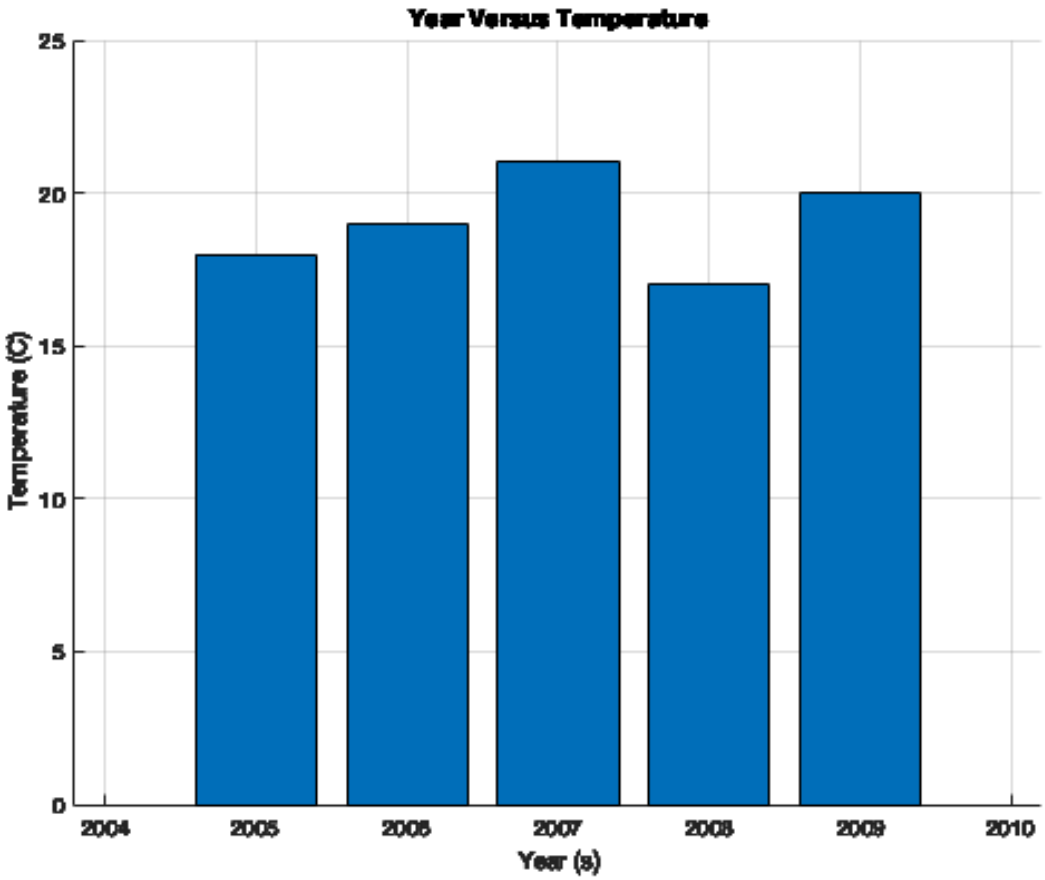
The following table shows the average temperature for each year in a certain city. Plot the data as a stem plot, a bar plot, and a stairs plot.

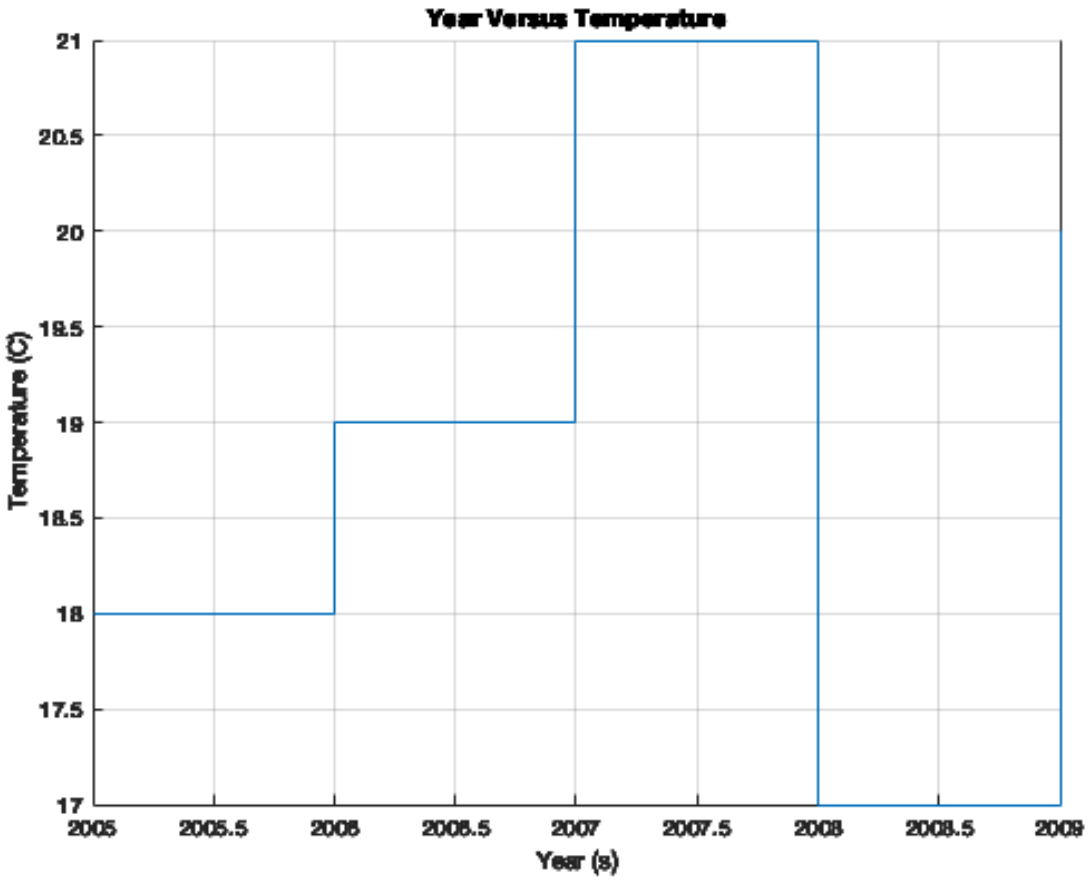
```
problem3Matrix = [2005:2009; [18, 19, 21, 17, 20]];

figure(31);
```

```
problem3Stem = axes();
hold(problem3Stem,'on');

stem(problem3Matrix(1,:), problem3Matrix(2,:), 'parent', problem3Stem);
grid on;

% Create title
title({'Year Versus Temperature'});

% Create ylabel
ylabel({'Temperature (C)'});

% Create xlabel
xlabel({'Year (s)'});

% Set the remaining axes properties
hold(problem3Stem,'off');

figure(32);
problem3Bar = axes();
hold(problem3Bar,'on');

bar(problem3Matrix(1,:), problem3Matrix(2,:), 'parent', problem3Bar);
grid on;

% Create title
title({'Year Versus Temperature'});

% Create ylabel
ylabel({'Temperature (C)'});

% Create xlabel
xlabel({'Year (s)'});

% Set the remaining axes properties
hold(problem3Bar,'off');

figure(33);
problem3Stairs = axes();
hold(problem3Stairs,'on');

stairs(problem3Matrix(1,:), problem3Matrix(2,:), 'parent', problem3Stairs);
grid on;

% Create title
title({'Year Versus Temperature'});

% Create ylabel
ylabel({'Temperature (C)'});

% Create xlabel
xlabel({'Year (s)'});

% Set the remaining axes properties
```

```
hold(problem3Stairs,'off');
```




Year Versus Temperature
25
20
15
10
5
0
Temperature (C)
2004
2005
2006
2007
2008
2009
2010
Year (s)



Problem 4

The future amount F of a principal P (present amount) invested in a savings account for a period of time paying an annual interest rate r (APR = Annual Percentage Rate) is given by:

$$F = P\left(1 + \frac{r}{n}\right)^{nt}$$

where n is the number of times per year the interest is compounded and t is the number of years. Example: for a 30 year home loan compounded monthly at an APR of 3.00%, n = 12 (12 months per year), t = 30 years, and r = 0.03 (3.00%). For continuous compounding, F = Pert. Suppose $10,000 is initially invested at 3.5% APR (r = 0.035). Plot F versus t for 0 < t < 20 years for four cases: continuous compounding, annual compounding (n = 1), quarterly compounding (n = 4), monthly compounding (n = 12). Show all four cases on the same subplot and label each curve. On a second subplot, plot the difference between the amounts obtained from continuous compounding and the other three cases.

```
% % Given

principal = 10000; % Initial amount
apr = 0.035; % APR

figure(41);
% problem4fplot = axes();
```

```
% hold(problem4fplot,'on');
subplot(2,1,1)
xlabel("Time(Years)")
ylabel("Future Amount($)")
title("Future Amount versus Time")
hold on;
grid on;
fplot(@(t) principal*(1+apr/1)^(1*t), [0,20], 'r');
fplot(@(t) principal*(1+apr/4)^(4*t), [0,20], 'g');
fplot(@(t) principal*(1+apr/12)^(12*t), [0,20], 'b');

subplot(2,1,2)
xlabel("Time(Years)")
ylabel("Difference from Continuous($)")
title("Difference from Continuous versus Time")
hold on;
grid on;
fplot(@(t) principal*exp(apr * t) - principal*(1+apr/1)^(1*t), [0,20], 'r');
fplot(@(t) principal*exp(apr * t) -principal*(1+apr/4)^(4*t), [0,20], 'g');
fplot(@(t) principal*exp(apr * t) -principal*(1+apr/12)^(12*t), [0,20], 'b');
grid on;
```

```
Warning: Function behaves unexpectedly on array inputs. To improve
 performance,
properly vectorize your function to return an output with the same size and
shape as the input arguments.
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shape as the input arguments.
```
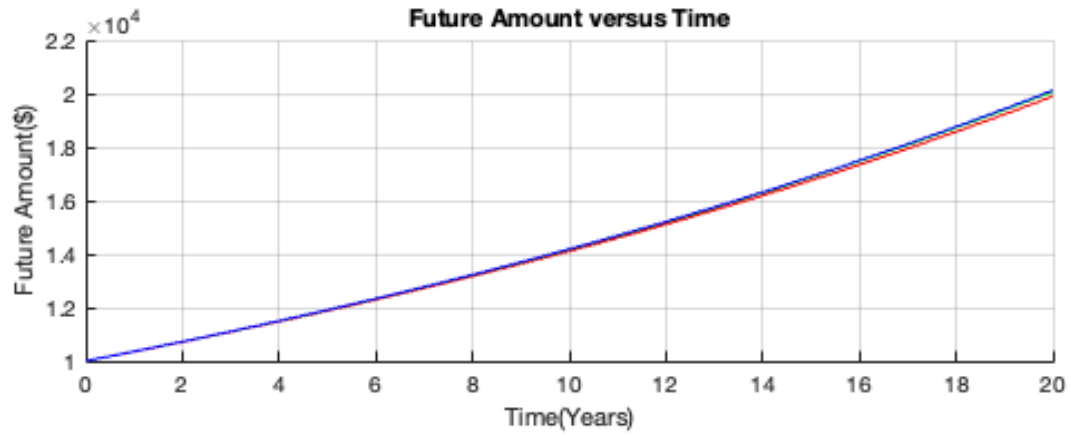
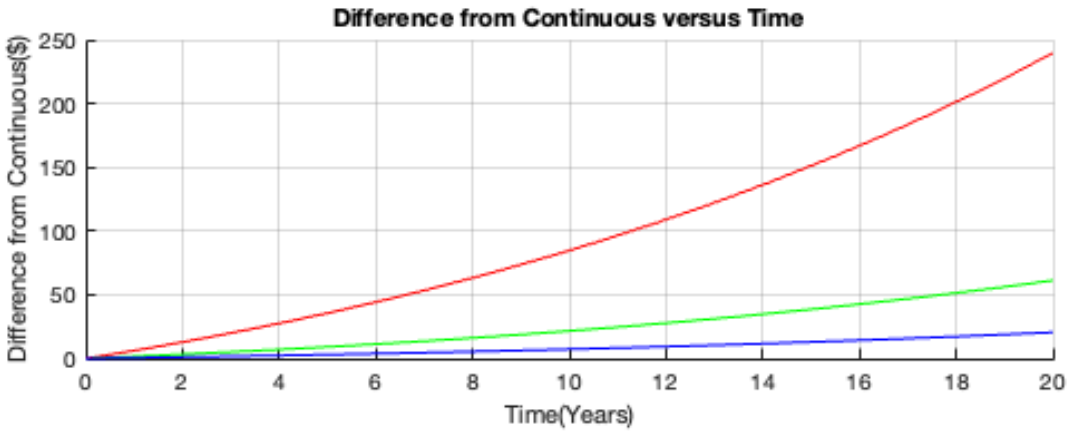
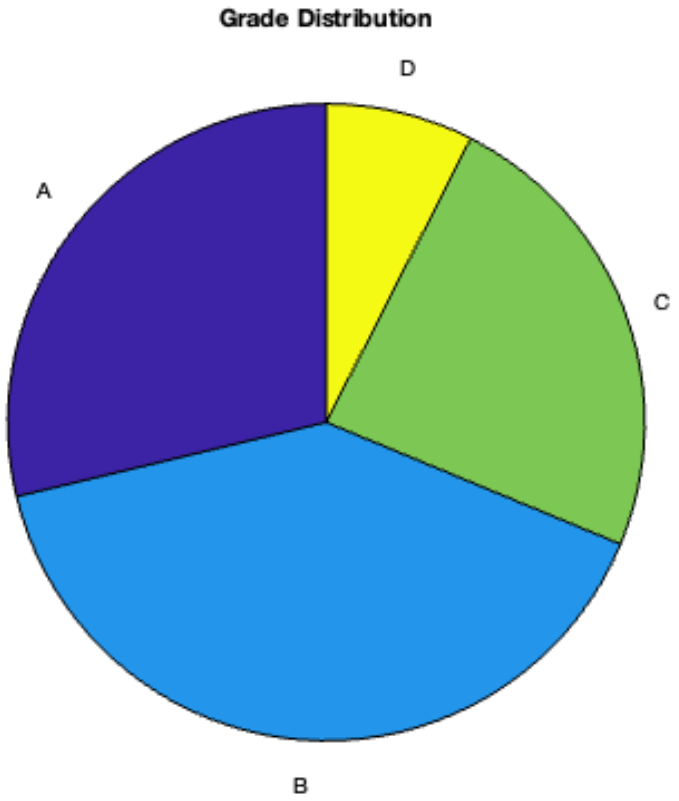





Problem 5

The grades of 80 students were distributed as follows Use the pie chart function pie to plot the grade distribution. Add the title “Grade Distribution” to the chart. Use the gtext function or the plot editor to add the letter grades to the sections of the pie chart.

```
problem5Data = [23,32,19,6];
problem5Labels = ["A","B","C","D"];

figure(51);
problem5Pie = pie(problem5Data, problem5Labels);

% Create title
title("Grade Distribution");
```



Published with MATLAB® R2022b