1) (20 points) Write the screen display for the following script and associated function in the space provided. For this question assume each output is put on one line and there are no blank lines between the outputs. You may not need all the lines provided. **Credit only given for work shown.**

```
% script
clear;
disp('Begin problem 1');
a=[1 -2 2 0 -3 3 4];
b=[-1 2 -3 4 -5 6 -1];
c=0;
n=7;
m=b(n)
while n>=0
    [m,n] = confuse1(m,n,a,b);
    c=c+1;
end
disp(['Number of loops is ',num2str(c)])
disp('bye bye')

function [m,n] = confuse1(m,n,a,b)
    if m>4
        disp('Branch 1')
        temp=a(n-1)*b(n+1);
        n=n-5;
        disp('temp')
    elseif (n<=2 | n==4)
        disp('Branch 2')
        m=m+6;
        temp=a(n+1)*b(m-1);
        disp(temp)
    else
        disp('Branch 3')
        temp=a(n)*b(m+3);
        n=abs(n-3);
        disp(temp)
    end
```

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2) (20 points) Write the screen display for the following script and associated function in the space provided. For this question assume each output is put on one line and there are no blank lines between the outputs. You may not need all the lines provided. Credit only given for work shown.

```matlab
x = 3;
y = 5;
i = 2;
z = [4 5 2 6 3];
disp('start')
while i <= 6
    if (i > 5)
        disp('done')
    elseif (i > 3 & i ~=5)
        back1 = confuse2(i,x,y,z);
        back1 = back1/z(i)
    else
        back2 = confuse3(i,y,x,z);
        back2 = back2/z(i)
    end
    i = i+1;
end

function out1 = confuse3(j,d,s,k)
    switch (k(j))
        case {1,2}
            out1 = d+5
        case {3,4}
            out1 = 2*s
        otherwise
            out1 = d+j*j+2*s
    end

function out2 = confuse2(j,y,x,k)
    temp = [1 1 1 1 1];
    for i=j:5
        %Hint write out all the values of temp
        temp(i) = k(i)+k(j);
    end
    out2 = sum(temp)
```

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3) (12 points) Write the screen display for the following script and associated function in the space provided. For this question assume each output is put on one line and there are no blank lines between the outputs.

```matlab
message1 = 'eating good';
message2 = 'makes studying satisfying';
total = [message1, ' food ', message2];
s1=['Be', message1(8:11)];
s2=''
for i=[7,8,2,11]
    s2=[s2, message2(i)];
end
s3=[message2(16:17), message2(21), message2(4)];
disp(total)
disp(s1)
disp([s2, ' ', s3])
```

4) (15 points) Show how the following equations can be represented and solved using Matrix Linear Algebra in MATLAB:

\[
\begin{align*}
  x_1 - 2x_2 + x_3 + 7x_4 - x_5 &= 18 \\
  4x_3 - 3x_5 &= 0 \\
  6(x_1 + x_2 - 2) - 2(x_2 + x_5) &= 11 \\
  x_5 &= 2 \\
  3x_1 + x_3 - 4x_5 &= -8
\end{align*}
\]

\[
A = \begin{bmatrix}
    1 & -2 & 1 & 7 & -1 \\
    0 & 4 & 0 & 0 & -3 \\
  6 & -2 & -2 & 1 & 0 \\
    0 & 1 & 0 & 0 & 1 \\
  3 & 0 & 1 & 0 & -4 \\
\end{bmatrix}
\]

\[
b = \begin{bmatrix}
  18 \\
  0 \\
  11 \\
  2 \\
  -8
\end{bmatrix}
\]

\[
x = \begin{bmatrix}
  x_1 \\
  x_2 \\
  x_3 \\
  x_4 \\
  x_5
\end{bmatrix}
\]
5) (18 Points) Assume the following program will determine the point value that a student accumulates towards season tickets, based on QPA, class year and whether he/she bought tickets the previous year. Use the following program to answer the questions in the box. FOR PARTS WHERE MORE THAN ONE VALUE IS REQUIRED ENTER THE ANSWER IN THE FORM “a+b=total.” Assume that no freshman had tickets last year.

```plaintext
year=input('Freshman (F), Sophomore (O), Junior (J), Senior (S):', 's');
lastyear=input('Had tickets last year? Yes (Y) or No (N)? ', 's');
qpa=input('Please enter your QPA as a value between 0 and 4: ');

if qpa >=2.0
    if lastyear =~='Y' & qpa>3.0
        switch year
            case 'F'
                points=135;
            case 'O'
                points = 155;
            case 'J'
                points = 175;
            case 'S'
                points = 195;
        end
    elseif lastyear==='N' & qpa<=3.0
        switch year
            case 'F'
                points=145;
            case 'O'
                points = 160;
            otherwise
                points = 185;
        end
    else
        switch year
            case 'F'
                points=125;
            case 'S'
                points = 250;
            otherwise
                points = 240;
        end
    end
else
    if year==='S'
        points = 105;
    else
        points=115;
    end
end

display('Your available points are')
display(points)
```

a) How many points would be awarded to a sophomore (QPA=3.8) who did not have tickets last year

points = ____________

b) How many points would be awarded to a junior (QPA=2.7) who had tickets last year

points = ____________

c) How many points would be awarded to a senior (QPA=1.9) who had tickets last year

points = ____________

d) How many points would be awarded to a senior (QPA=3.0) who did not have tickets last year

points = ____________

e) How many points would be awarded to a freshman (QPA=3.5) and her sophomore roommate (QPA=2.1) who did not have tickets last year

points = ____________

f) How many points would be awarded to a freshman (QPA=1.7) and her sister, a senior (QPA=3.5) who had tickets last year

points = ____________
6) (20 Points) The polyfit command attempts to fit a polynomial \((y=a_nx^n + a_{n-1}x^{n-1} + \ldots + a_0)\) to a dataset.

The following is a list of the polyfit commands and results (each for a different dataset). Write the equation represented by the output in the form \(y = f(x)\). Simplify as much as possible. Show your work.

- Coeff=polyfit(x,y,3)
  Coeff = 6  2  0  -1
  
  Equation:
  Coeff=polyfit(x,log10(y),1)
  Coeff = 4  3
  
  Equation:
  Coeff=polyfit(log(x),log(y),1)
  Coeff = 4  3
  
  Equation:
  Coeff=polyfit(x,log(y),1)
  Coeff = 4  3
  
  Equation:
7) (15 points) Assume you wish to analyze an equation at various data points, where the x coordinates are stored in the array x. The user enters the following commands to define this as a m-file titled “fun_x.m”.

\[
\text{function } y = \text{fun}_x(x) \\
y = (\exp(0.4x) \cdot \cos(0.3x \cdot x^2 - 4)) / \log(x);
\]

Answer the following questions:

a) Assume you wish to produce the graph shown. Enter the fplot command to:

1) plot the equation if it is defined as a function, as shown above.

2) plot the equation if it is defined as the string variable fun_string.

b) Enter the Matlab command to find the x coordinate of the local minimum near x = 7 for the above equation. Call this result “x_min”.

1) If it is defined as a function, as shown.

2) If it is defined as the string variable fun_string.

c) Enter the Matlab command to find the area under the curve from x = 4 to x = 7, using the quadl command.

d) Using the result “x_min” from above, enter the Matlab command to find the y coordinate of the local minimum near x = 7. Call this result y_min. Assume the equation is defined as shown above as a function.

e) Assume the above equation is now stored in a string titled “fun_string” Enter the Matlab command to find the x coordinate of the root near x = 6.5.
8) **(15 points)** Circle the correct answer or fill in the blank:

(4 points) You have a MATLAB script that defines an x and y array and also includes the following 2 lines of code:
```matlab
plotcolor='r' and plotsym='*'
```
What is the MATLAB command to plot the two arrays using the color and symbol type variables defined above?

```
(x=15;
for i=6:-2:1
x=x-i;
end
display(x)
```

(2 points) What is the output of the following script?

a) x = 27  
   b) x = 15  
   c) x = 3  
   d) x = 1  
   e) none of the above

(2 points) Assume you want to ask the user to enter their name and store the data in a variable named “my_name”. What command do you enter?

a) input('What is your name?','s')  
   b) my_name = input('What is your name?','s')  
   c) my_name = input('What is your name?')  
   d) my_name = load(input('What is your name?','s'))  
   e) my_name = load('What is your name?','s')

(2 points) If you have a set of x vs. y data and you would like to fit an exponential function \(y = be^{ax}\), what command would you enter in MATLAB to help you get the coefficients ‘a’ and ‘b’?

a) coeff = polyfit(log(x), log(y), 1)  
   b) coeff = polyfit(x, log(y), 1)  
   c) coeff = polyfit(x, log10(y), 1)  
   d) coeff = polyfit(x, ln(y), 1)  
   e) coeff = polyfit(ln(x), y, 1)

(2 points) If you wanted to create a function which calculated both the ‘displacement’ and ‘velocity’ of the motion of a physics experiment, where the ‘displacement’ and ‘velocity’ are returned to the script from where the function was called, and the ‘time’ was passed from the script to the function, what would be a valid first line for the function file?

a) function [time] = motion( )  
   b) [time] = motion(displacement, velocity)  
   c) [displacement, velocity] = motion(time)  
   d) function [displacement, velocity] = motion(time)  
   e) function [time] = motion(displacement, velocity)

(3 points) Which two commands would generate the same vector x?  
(CIRCLE THE TWO THAT MATCH)

a) x = 1 : 2 : 0.1  
   b) x = 1 : 0.1 : 2  
   c) x = linspace(1, 2, 10)  
   d) x = linspace(1, 2, 11)  
   e) x = linspace(1, 2, 0.1)