PRACTICE SET

PART 1: MATRIX

Problem 1:

Type this array into a MATLAB Script File to carry out the following instructions:

$$\mathbf{A} = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

a. Use MATLAB to create an array **B** by copying the elements from the second and third columns of array **A (1 Point)**.
b. Use MATLAB to create an array **C** by copying the elements from the first and second rows of array **A (1 Point)**.
c. Use MATLAB's Matrix Multiplication (*) to calculate $\mathbf{D} = \mathbf{B} * \mathbf{C}$ **(1 Point)**.
d. Use MATLAB's **max** function to create a vector that contains the maximum values of each column of **D (1 Point)**.
e. Use MATLAB's **min** function to create a vector that contains the minimum values of each row of **D (1 Point)**.
f. Use MATLAB's Matrix Multiplication (*) to multiply the two vectors found in parts *d* and *e* **(1 Point)**.

Problem 2:

P1. What is the output when executing the following Matlab code?

```
clear;

for i=1:5

      for j=i:5

            M(i, j) = i+j;

            M(j, i)= M(i,j);

      end

end

M(4, 3)
```

Problem 3:

Use loops to create a 4×6 matrix in which the value of each element is two times its row number minus three times its column number. For example, the value of element (2,5) is $2 \times 2 - 3 \times 5 = -11$.

PART 2: FOR and WHILE – LOOPS

Each problem, we code for three methods: cumsum, for-loops and while-loops.

Then, plot figure.

Problem 1:

$$S = \sum_{n=1}^{100} \frac{(-1)^{n+1}}{(2n-1)!}$$

Problem 2:

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$

PART 3: IF STATEMENTS with indicator functions, sub-function and recursive function

Problem 1:

$$f(x) = \begin{cases} x^2 + 8, & if \quad -5 < x; \\ -x^3 + 2, & otherwise \end{cases}$$

Problem 2:

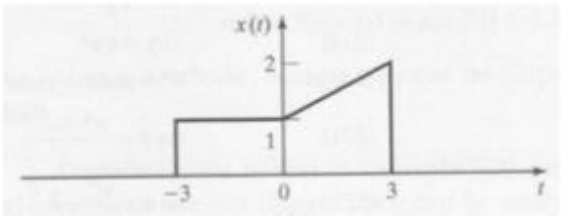
$$f(x) = \begin{cases} 3x^2 - x, & if\ x < -6 \\ \sqrt{7-x}, & if \quad -6 \le x \le 5 \\ 8x - 3, & if \quad x > 5 \end{cases}$$

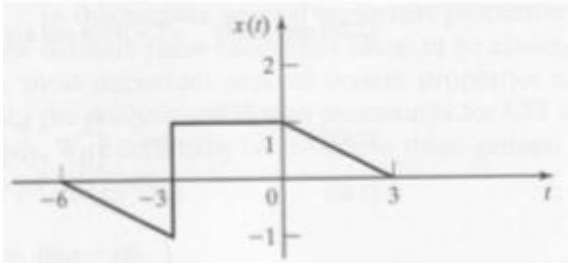
Problem 3:

Write a MATLAB code to solve the conditional function below. The MATLAB code must have input variables such as x and y. (25p)

$$f(x,y) = \begin{cases} x^2 - y & , \quad x \ge 5 \text{ and } y > 2 \\ x - y^2 & , \quad x < 5 \text{ or } 0 < y \le 2 \\ x^3 + y^3 & , \quad x \text{ is not zero and } y < 0 \end{cases}$$

Problem 4:





Problem 5:

$$a_0 = 3$$
$$a_{n+1} = a_n + 2$$

Problem 6:

$$a_{n+1} = a_n + (-1)^{n-1} \cdot \frac{a_2 - a_1}{2^{n-1}}$$

PART 4: Extra Questions:

Problem 1: How many times, MATLAB displays the script.

```
x = 3;
while (x < 8)
     disp('Am I done yet?')
     x = x + 2.5;
end
```

Problem 2:

```
function r = myfactorial(n)
   if n <= 0
     r = 1;
   else
     r = n * myfactorial(n-1);
   end
 end
```

Problem 3:

The Taylor series expansion for a^x is:

$$a^x = \sum_{n=0}^{\infty} \frac{(\ln a)^n}{n!} x^n$$

Write a MATLAB program that determines a^x using the Taylor series expansion. The program asks the user to type a value for x. Use a loop for adding the terms of the Taylor series. If c_n is the nth term in the series, then the sum S_n of the n terms is $S_n = S_{n-1} + c_n$. In each pass calculate the estimated error E given by $E = \left| \frac{S_n - S_{n-1}}{S_{n-1}} \right|$. Stop adding terms when $E < 0.000001$.

Problem 4:

Write a MATLAB program in a script file that finds a positive integer n such that the sum of all the integers $1 + 2 + 3 + \ldots + n$ is a number between 100 and 1000 whose three digits are identical. As output, the program displays the integer n and the corresponding sum.