University of Bahrain
College of Information Technology
Department of Computer Engineering

Experiment 1

Introduction to MATLAB

Prepared By

Name : Ali Redha Ali

ID: 20195330

Sec: 01

Course Number: ITCE340/272

Objective:

The objective of this lab is to know how to use MATLAB

What is MATLAB?

MATLAB® is a high-performance language for technical computing. It integrates computation, visualization, and programming in an easy-to-use environment where problems and solutions are expressed in familiar mathematical notation.
Typical uses include:

- Math and computation
- Algorithm development
- Data acquisition Modeling, simulation, and prototyping
- Data analysis, exploration, and visualization
- Scientific and engineering graphics
- Application development, including graphical user interface building

MATLAB is an interactive system whose basic data element is an array that does not require dimensioning. This allows you to solve many technical computing problems, especially those with matrix and vector formulations, in a fraction of the time it would take to write a program in a scalar non-interactive language such as C or FORTRAN.

The name MATLAB stands for matrix laboratory. MATLAB was originally written to provide easy access to matrix software developed by the LINPACK and EISPACK projects.
Today, MATLAB engines incorporate the LAPACK and BLAS libraries, embedding the state of the art in software for matrix computation.

MATLAB has evolved over a period of years with input from many users. In university environments, it is the standard instructional tool for introductory and advanced courses in mathematics, engineering, and science. In industry, MATLAB is the tool of choice for high-productivity research, development, and analysis.

MATLAB features a family of add-on application-specific solutions called toolboxes. Very important to most users of MATLAB, toolboxes allow you to learn and apply specialized technology. Toolboxes are comprehensive collections of MATLAB functions (M-files) that extend the MATLAB environment to solve particular classes of problems. Areas in which toolboxes are available include signal processing, control systems, neural networks, fuzzy logic, wavelets, simulation, and many others.

Report

1- Consider the following 8x8 input block:

A= [450 150 350 200 125 134 32 150
250 250 150 200 123 134 32 50
130 50 250 100 120 10 32 50
50 15 250 120 123 13 32 150
220 15 250 200 120 14 32 20
250 10 50 40 13 134 32 40
50 10 20 20 12 13 32 30
150 10 250 200 20 16 32 150]

2- Calculate the sum of matrix A.

```
E =

        1550         510        1570        1080         656         468         256         640
```

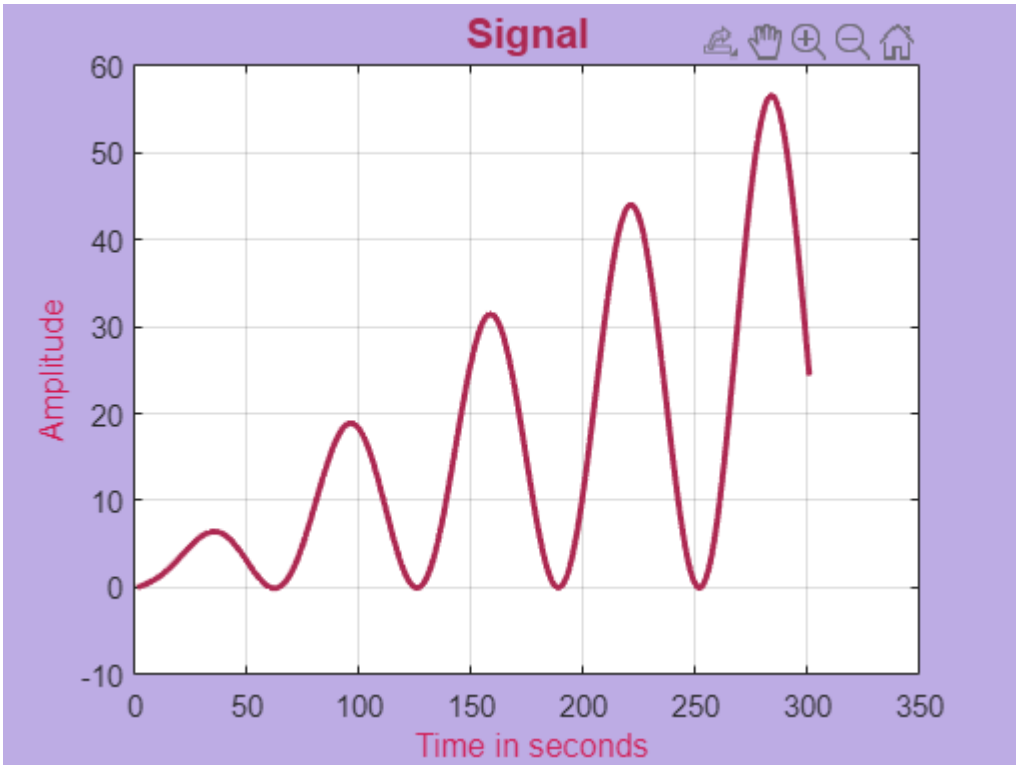
3- Calculate the DCT matrix A.

```
T =

  548.0078  180.3122  555.0788  381.8377  231.9310  165.4630   90.5097  226.2742
  180.3479  179.5427  158.6418   83.6958  127.6534   73.6273         0   23.7734
  137.1328   98.3205   21.3196   52.2625  -44.8874   57.3926         0   58.1388
  211.2820   15.1763  -69.1859  -24.7589  -20.4807   98.3402         0  -42.9669
   67.1751  -45.9619  222.7386  127.2792   42.4264  -40.3051         0  106.0660
  -97.1233  -74.9025  -16.4635 -115.6768  -13.5816  -39.0702         0   45.2131
  100.0979  -67.5135   79.1863  -21.6478  -19.6754   22.1492         0   29.4938
    7.1851  -36.3827   56.7894   14.1742   22.4205  -73.1624         0  -65.1494
```

4- Plot the function y = sin(x) + x - x cos(x) in two separate figures for the intervals: 0 < x < 30 and 100 < x < 100. Add a title and axes description.

Question 4 part 1

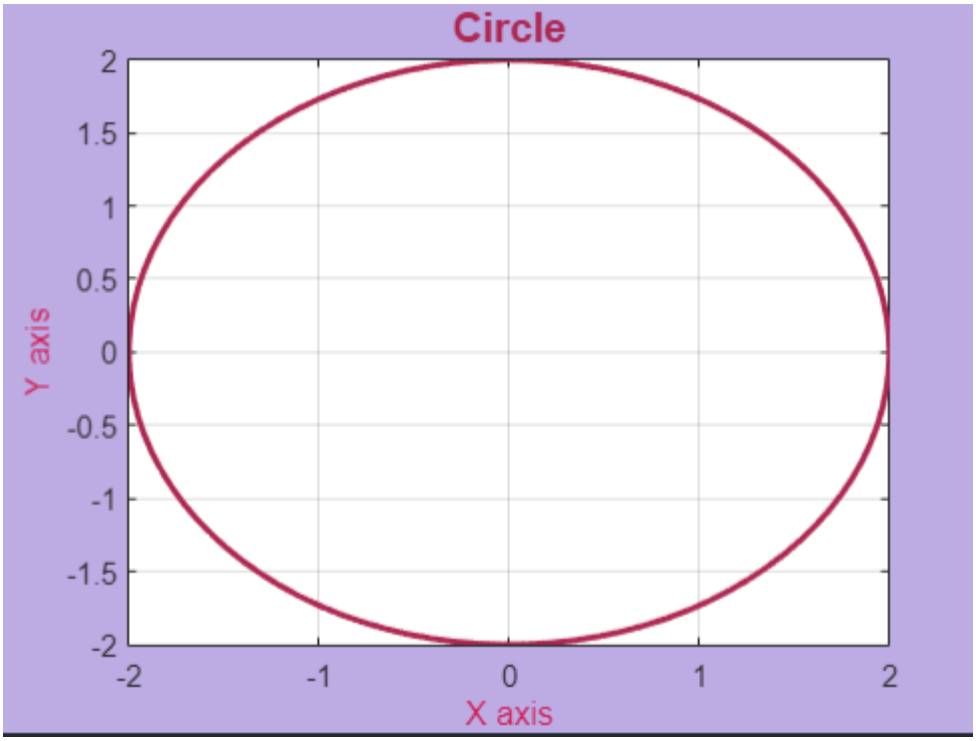
```
f14=figure(1)
x=0:0.1:30;
y=sin(x)+x-x.*cos(x);
set(f14,'color','#BDACE4');
plot(y,'lineWidth',2,'color','#AD2851');grid on;
title('Signal','FontSize',14,'Color','#AD2851')
xlabel(' Time in seconds','color','#D21D55');
ylabel('Amplitude','color','#D21D55');
```



5- Plot a circle with the radius r = 2, knowing that the parametric equation of a circle is [x(t), y(t)] = [r cos(t); r sin(t)] for t = [0; 2pi].

Question 5

```
r=2;
t=linspace(0,2*pi);
plot(r*cos(t),r*sin(t),'lineWidth',2,'color','#AD2851');grid on
xlabel('X axis','color','#D21D55');
ylabel('Y axis','color','#D21D55');
title('Circle','FontSize',14,'Color','#AD2851')
```



6- Plot

$X(t)=Ce^{at}$

C=0.5 , a=0.2

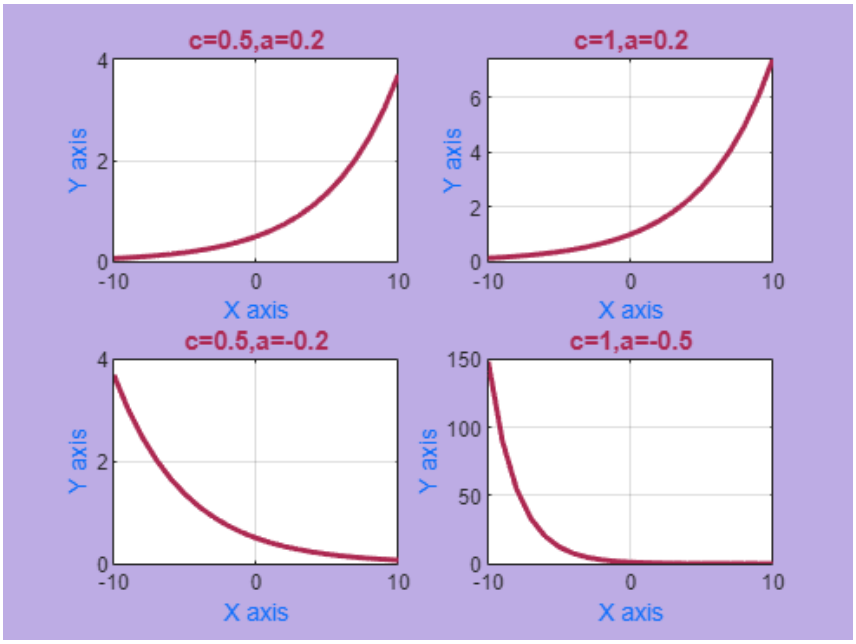
b- C=1 , a=0.2

c- C= 0.5, a=-0.2

d- C=1, a= -0.5

Question 6

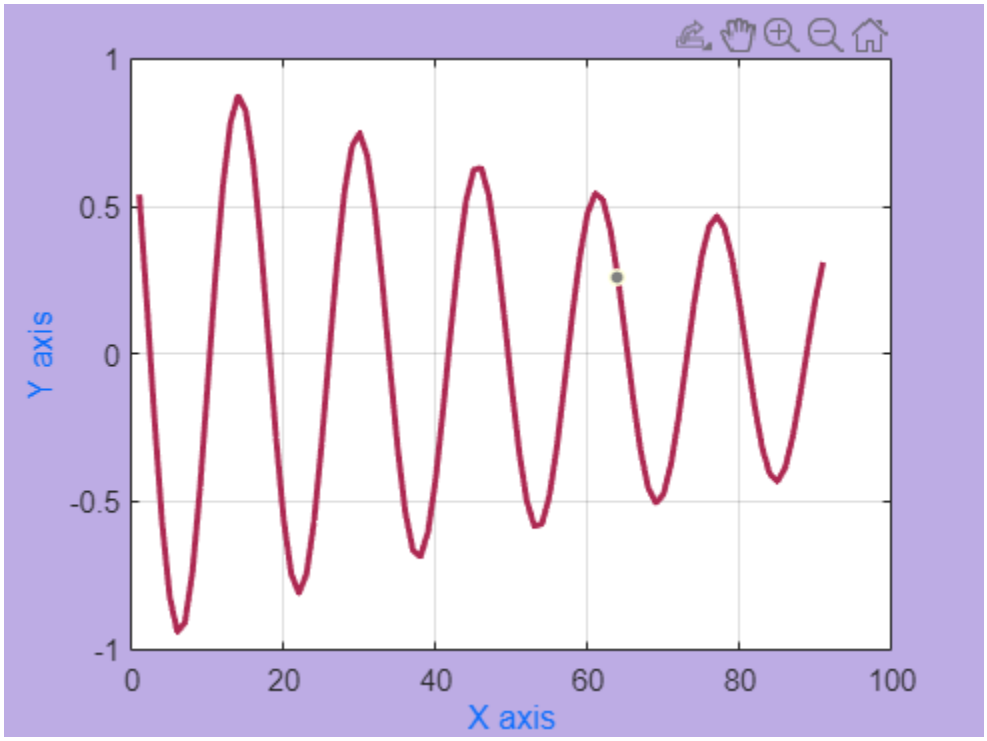
```
t=-10:10;
c=0.5;
a=0.2;
subplot(2,2,1);
plot(t,c*exp(a*t),'lineWidth',2,'color','#AD2851');grid on
title('c=0.5,a=0.2','FontSize',10,'Color','#AD2851')
xlabel('X axis','color','#0d6efd');
ylabel('Y axis','color','#0d6efd');


c1=1;
a1=0.2;
subplot(2,2,2);
plot(t,c1*exp(a1*t),'lineWidth',2,'color','#AD2851');grid on
title('c=1,a=0.2','FontSize',10,'Color','#AD2851')
xlabel('X axis','color','#0d6efd');
ylabel('Y axis','color','#0d6efd');

c2=0.5;
a2=-0.2;
subplot(2,2,3);
plot(t,c2*exp(a2*t),'lineWidth',2,'color','#AD2851');grid on
title('c=0.5,a=-0.2','FontSize',10,'Color','#AD2851')
xlabel('X axis','color','#0d6efd');
ylabel('Y axis','color','#0d6efd');

c3=1;
a3=-0.5;
subplot(2,2,4);
plot(t,c3*exp(a3*t),'lineWidth',2,'color','#AD2851');grid on
title('c=1,a=-0.5','FontSize',10,'Color','#AD2851')
xlabel('X axis','color','#0d6efd');
ylabel('Y axis','color','#0d6efd');
```



-

7- Plot :

a. e(0.5t) cos (2t+1)

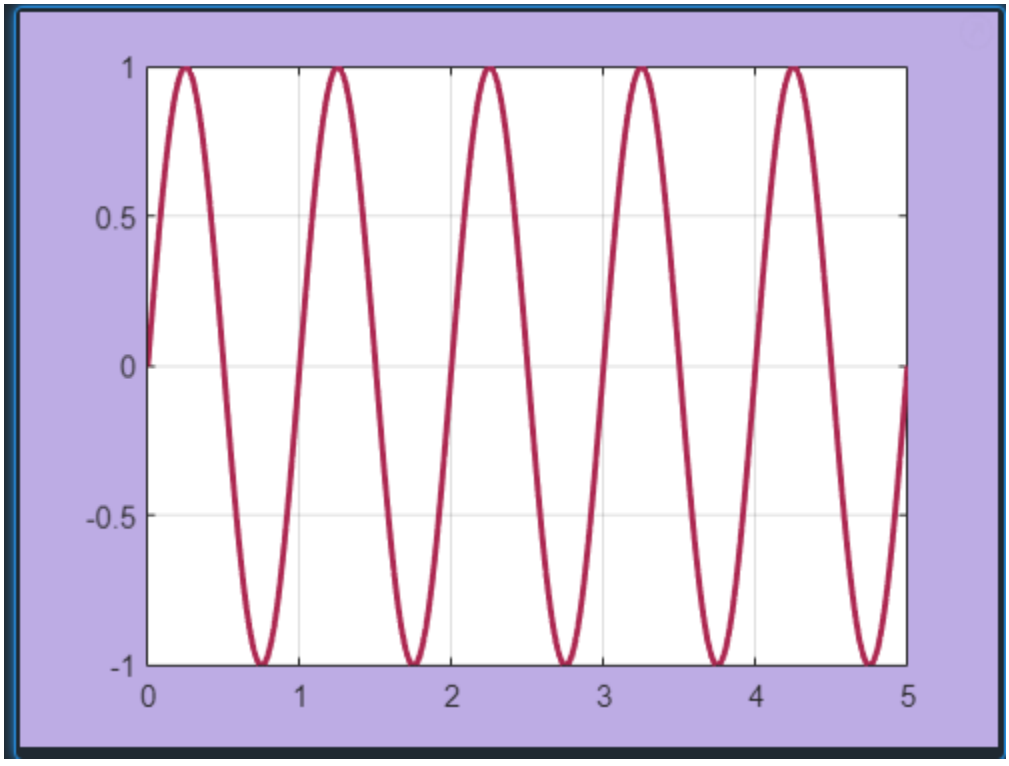


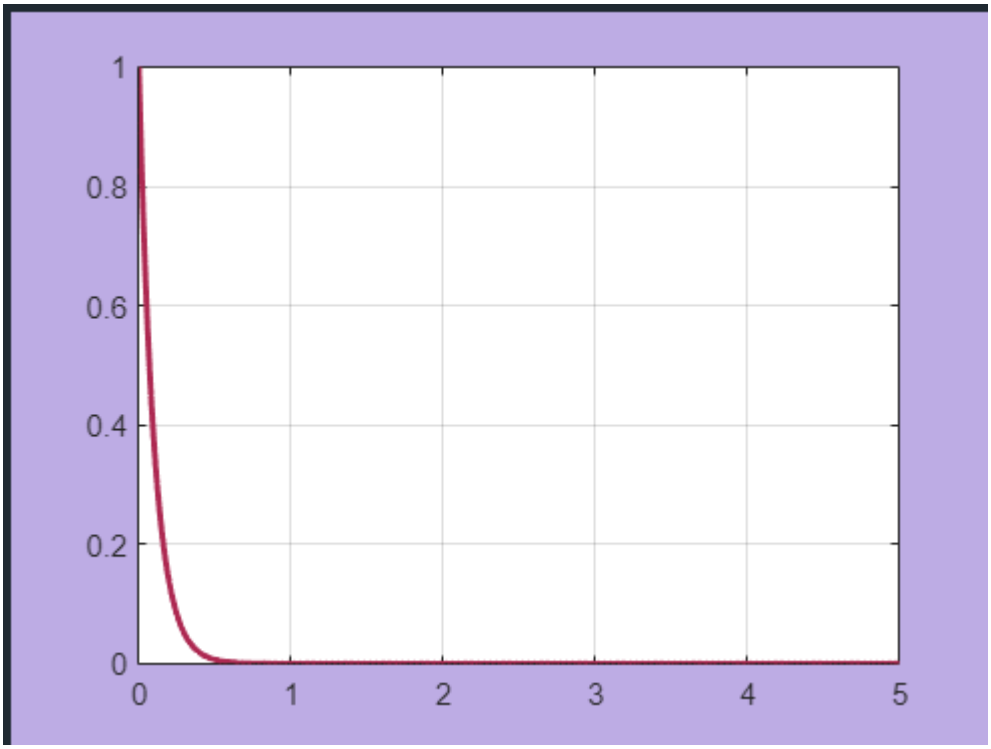
b. $e^{(-0.1t)}$ cos (4t+1)

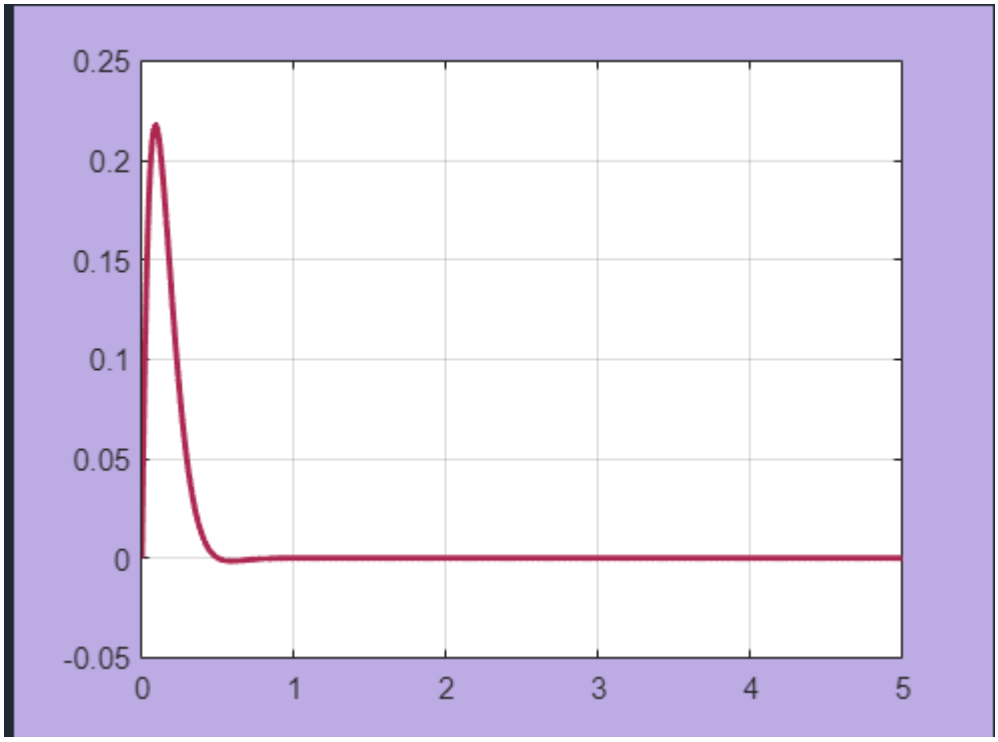
8- If x(t)=sin (2Π t) and y(t) = e-10t z= x(t) * y(t)

Question 8

```
89
90
91  t=0:0.01:5;
92  f69 =figure(69)
93  set(f69,'color','#BDACE4');
94  plot(t,sin(2*pi*t),'lineWidth',2,'color','#AD2851');grid on
95  f690 =figure(690)
96  set(f690,'color','#BDACE4');
97
98  plot(t,exp(-10*t),'lineWidth',2,'color','#AD2851');grid on
99  f6900 =figure(699)
100 set(f6900,'color','#BDACE4');
101 y=sin(2*pi*t).*exp(-10*t);
102 plot(t,y,'lineWidth',2,'color','#AD2851');grid on
103
104
105
```




1
0.8
0.6
0.4
0.2
0
0
1
2
3
4
5

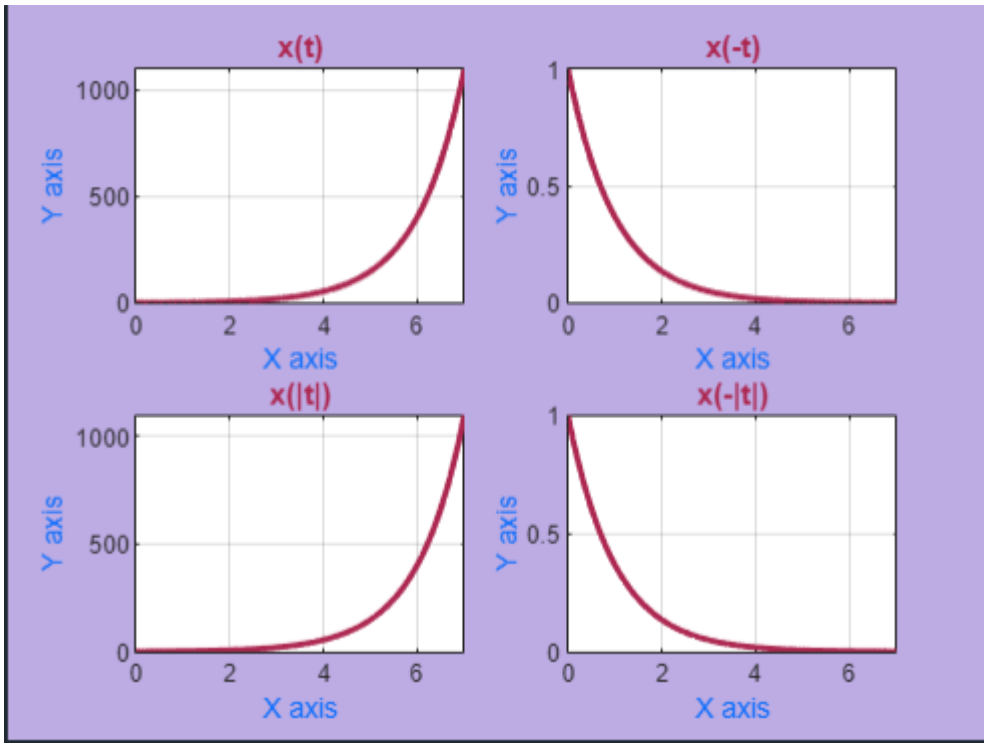

0.25
0.2
0.15
0.1
0.05
0
-0.05
0
1
2
3
4
5

Plot x(t), y(t), z(t)
9- If x(t) = exp(t)

Draw:
a. x(t)
b. x(-t)
c. exp(|t|)
d. exp(-|t|)

Quetiton 9

```
t=0:0.1:7
subplot(2,2,1);
x=exp(t);
plot(t,x','lineWidth',2,'color','#AD2851');grid on
title('x(t)','FontSize',10,'Color','#AD2851');
xlabel('X axis','color','#0d6efd');
ylabel('Y axis','color','#0d6efd');



subplot(2,2,2);
x1=exp(-t);
plot(t,x1,'lineWidth',2,'color','#AD2851');grid on
title('x(-t)','FontSize',10,'Color','#AD2851');
xlabel('X axis','color','#0d6efd');
ylabel('Y axis','color','#0d6efd');



subplot(2,2,3);
x2=exp(abs(t));
plot(t,x2,'lineWidth',2,'color','#AD2851');grid on
title('x(|t|)','FontSize',10,'Color','#AD2851');
xlabel('X axis','color','#0d6efd');
ylabel('Y axis','color','#0d6efd');



subplot(2,2,4);
x3=exp(-abs(t));
plot(t,x3,'lineWidth',2,'color','#AD2851');grid on
title('x(-|t|)','FontSize',10,'Color','#AD2851');
xlabel('X axis','color','#0d6efd');
ylabel('Y axis','color','#0d6efd');
```


x(t)
x(-t)
x(|t|)
x(-|t|)
Y axis
X axis
1000
500
0
1
0.5
0
2
4
6

Conclusion:

In this lab I learned a lot of things which are

- Basic of MATLAB function
- Properties of signals
- What affects signals
- How signal will change if we change the variables