INTRODUCTION TO MATLAB GRAPHS

ECE 416 – DIGITAL COMMUNICATION

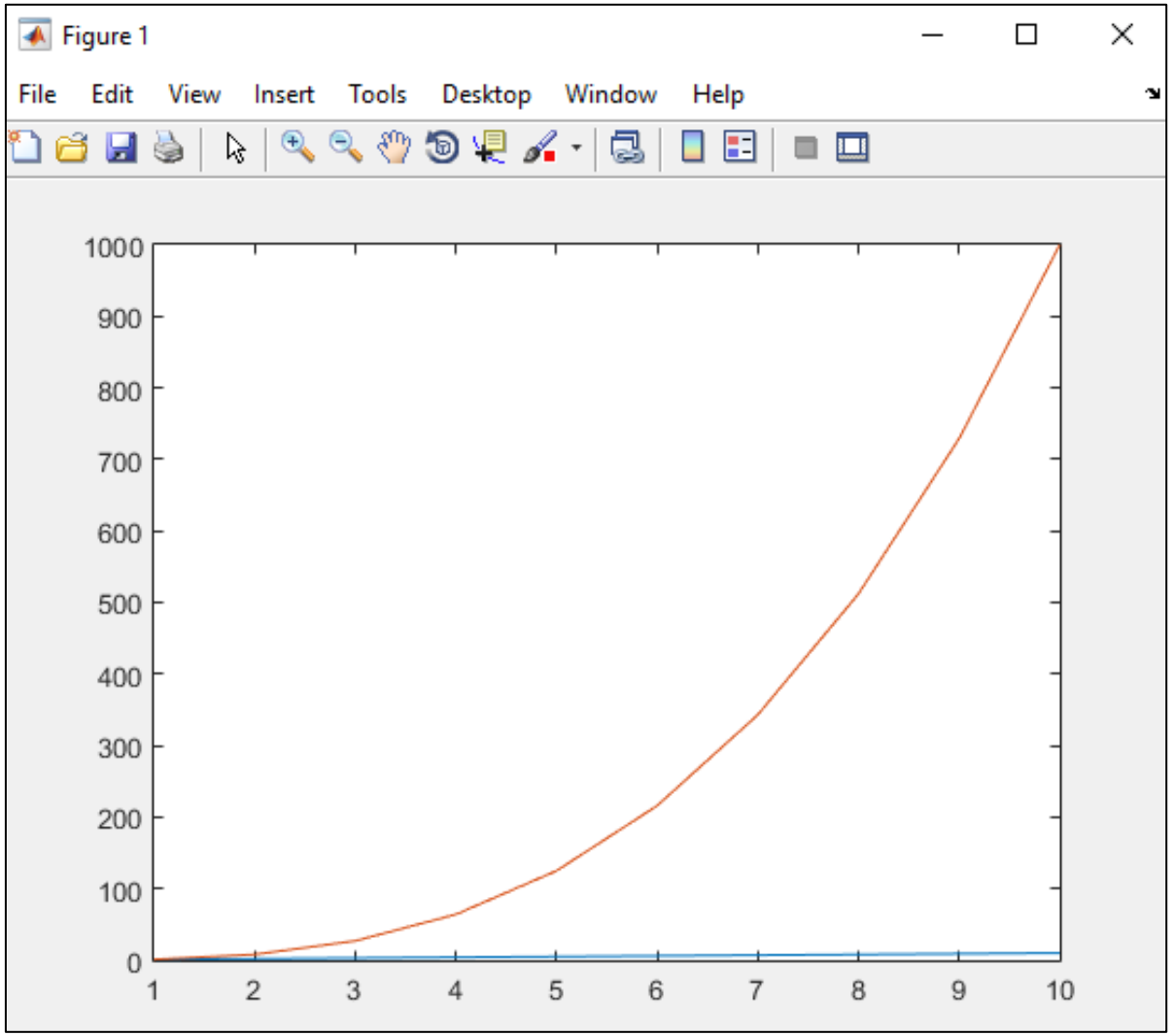
Thursday, 29 September 2022

PLOTTING A BASIC LINE GRAPH

To display a line graph of function $y = x^3$

Enter

```
x = [1 2 3 4 5 6 7 8 9 10];
y = x.^3;
plot(x,y)
```



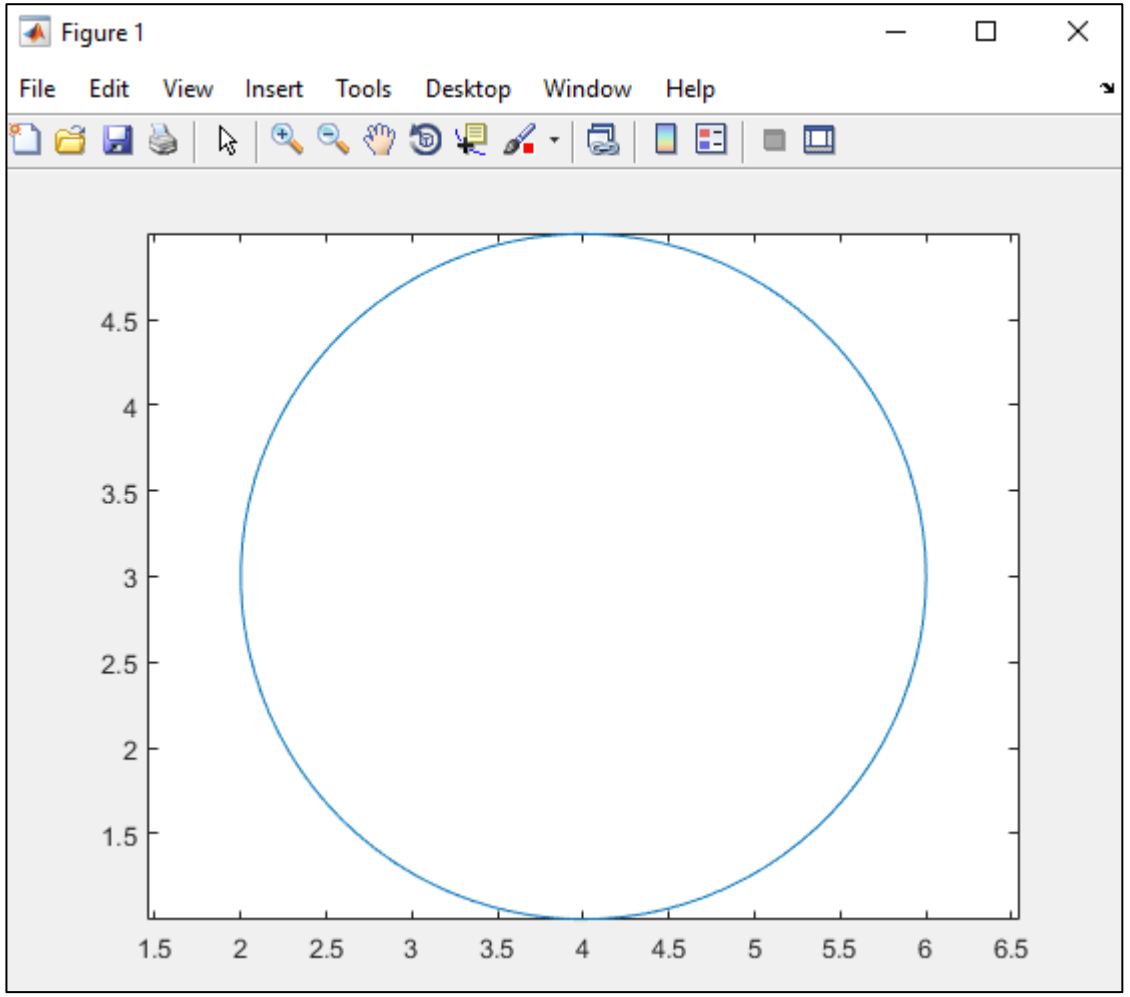
PLOTTING A CIRCLE

Objectives:

- To plot a circle centred at the point (4,3) with a radius equal to 2.
- To use axis equal to use equal data units along each coordinate direction.

Objective

```
r = 2;
xc = 4;
yc = 3;
theta = linspace(0,2*pi);
x = r*cos(theta) + xc;
y = r*sin(theta) + yc;
plot(x,y)
axis equal
```

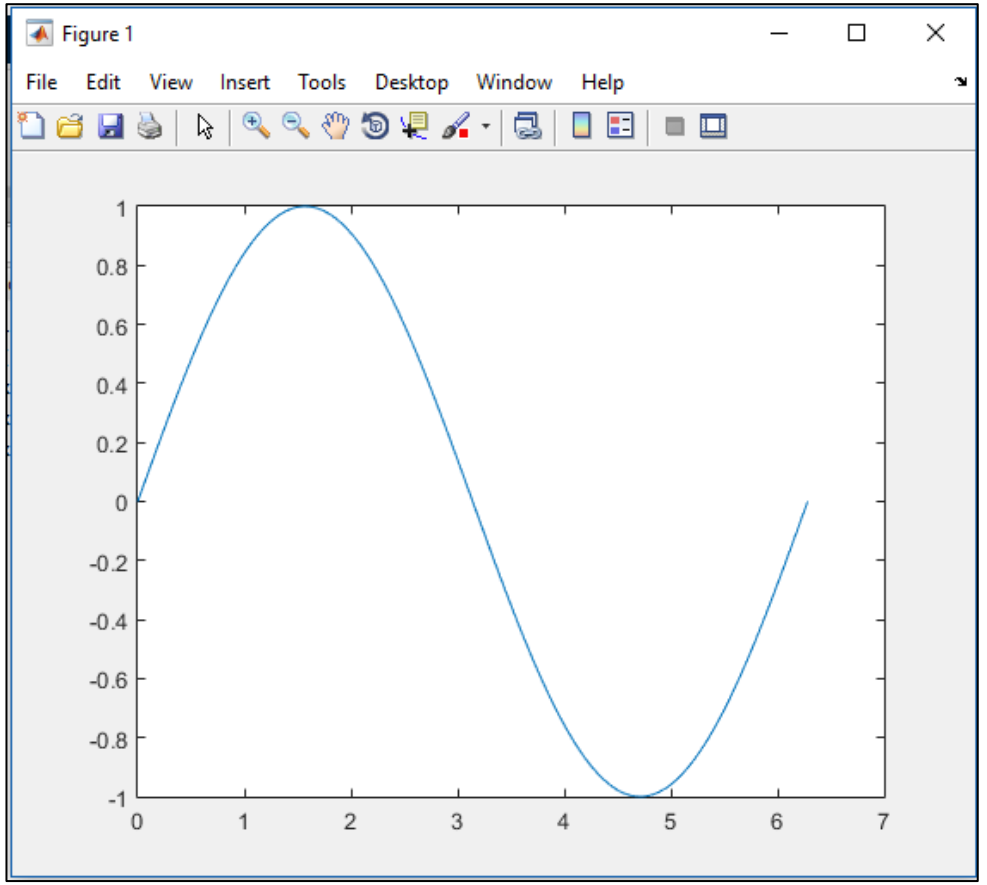


PLOTTING SINGLE LINE GRAPH OF FUNCTION: $y = \sin\left(\frac{2\pi n}{100}\right)$

Define x as a vector of linearly spaced values between 0 and 2π using increment of $\frac{\pi}{100}$.

Enter

```
x = 0 : pi/100 : 2*pi;
y = sin(x);
Plot(x,y)
```



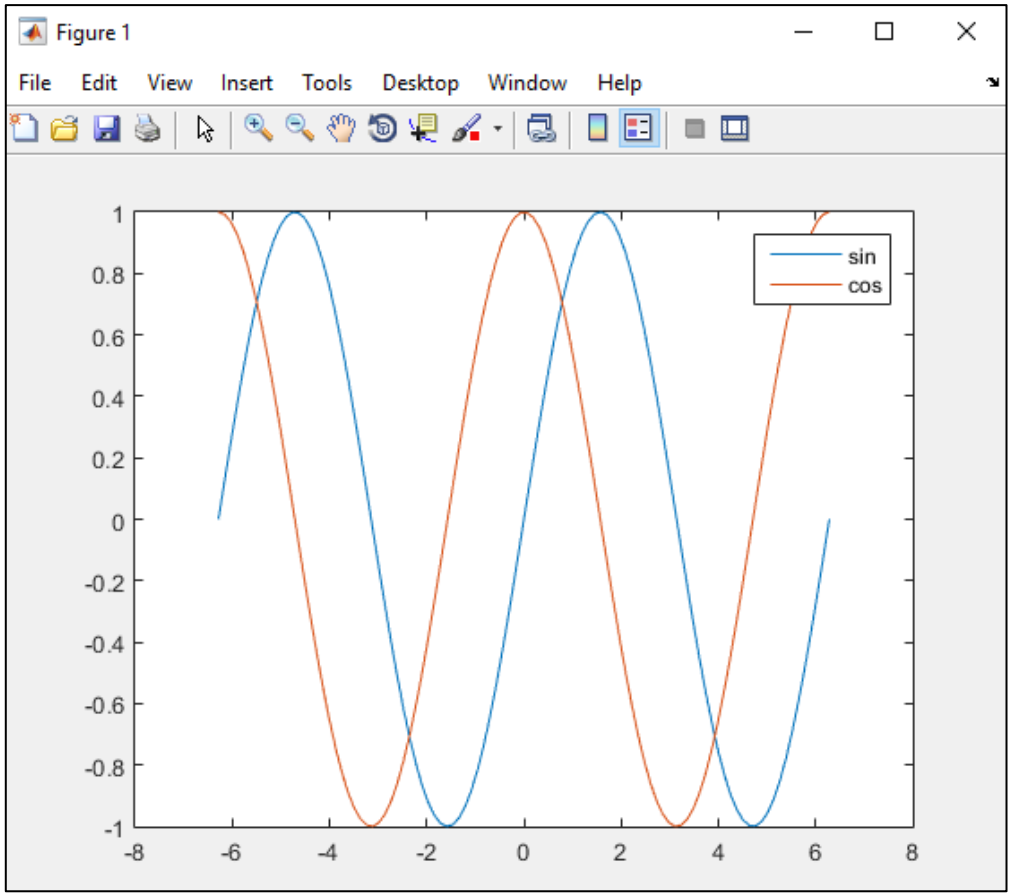
PLOTTING MULTIPLE LINE GRAPH OF FUNCTIONS:

$y1 = \sin\left(\frac{2\pi n}{100}\right)$ and $y2 = \cos\left(\frac{2\pi n}{100}\right)$

- Define x as 100 linearly spaced values between -2π and 2π.
- Define y1 and y2 as sine and cosine values of x.
- Create a line plot of both sets of data.

Enter

```
x = linspace(-2*pi,2*pi);
y1 = sin(x);
y2 = cos(x);
plot(x,y1,x,y2)
```



PLOTTING A LINE GRAPH FROM A MATRIX

Define y as the 8-by-8 matrix returned by the magic function and plot.

Enter

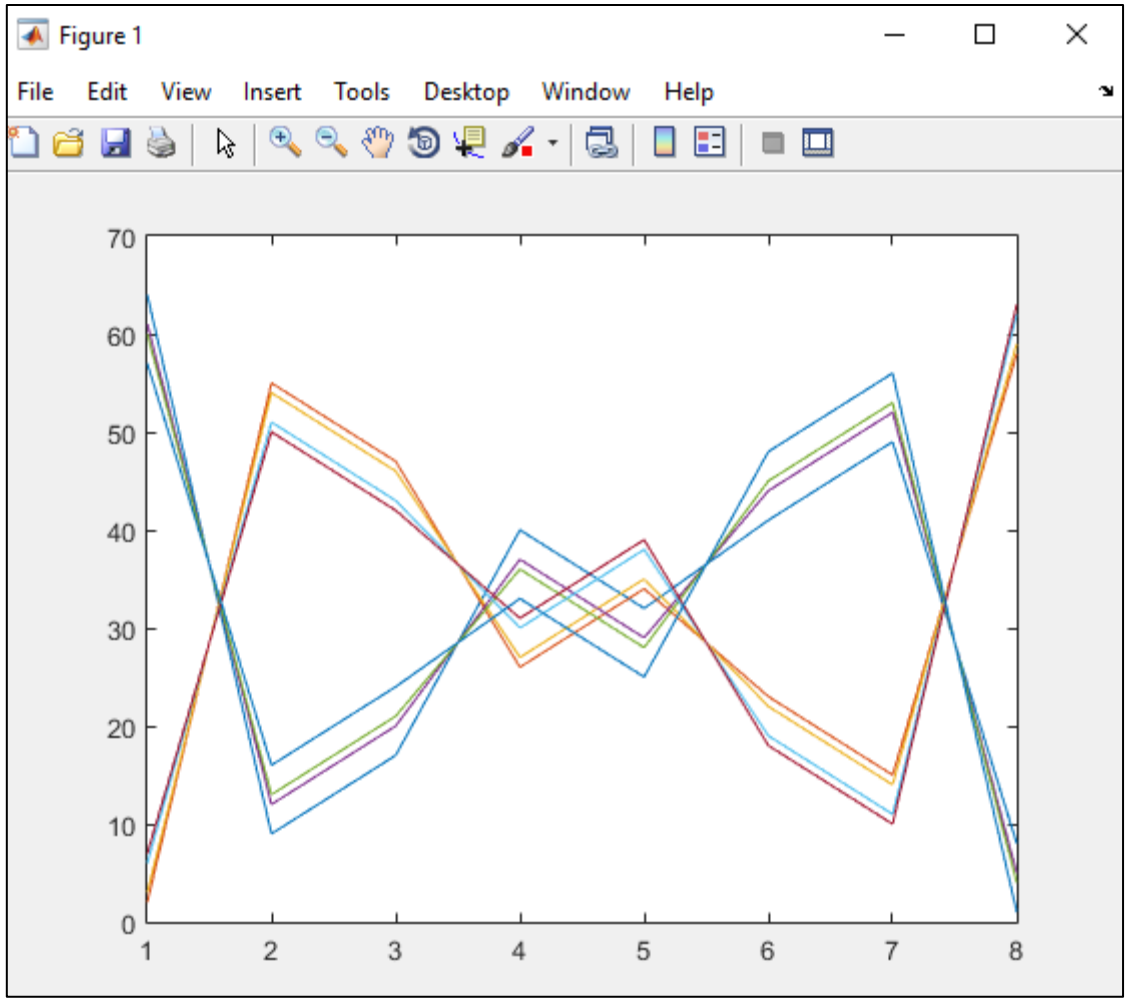
Y = magic(8)

```
>> Y = magic(8)

Y =

    64     2     3    61    60     6     7    57
     9    55    54    12    13    51    50    16
    17    47    46    20    21    43    42    24
    40    26    27    37    36    30    31    33
    32    34    35    29    28    38    39    25
    41    23    22    44    45    19    18    48
    49    15    14    52    53    11    10    56
     8    58    59     5     4    62    63     1

>> plot(Y)
```

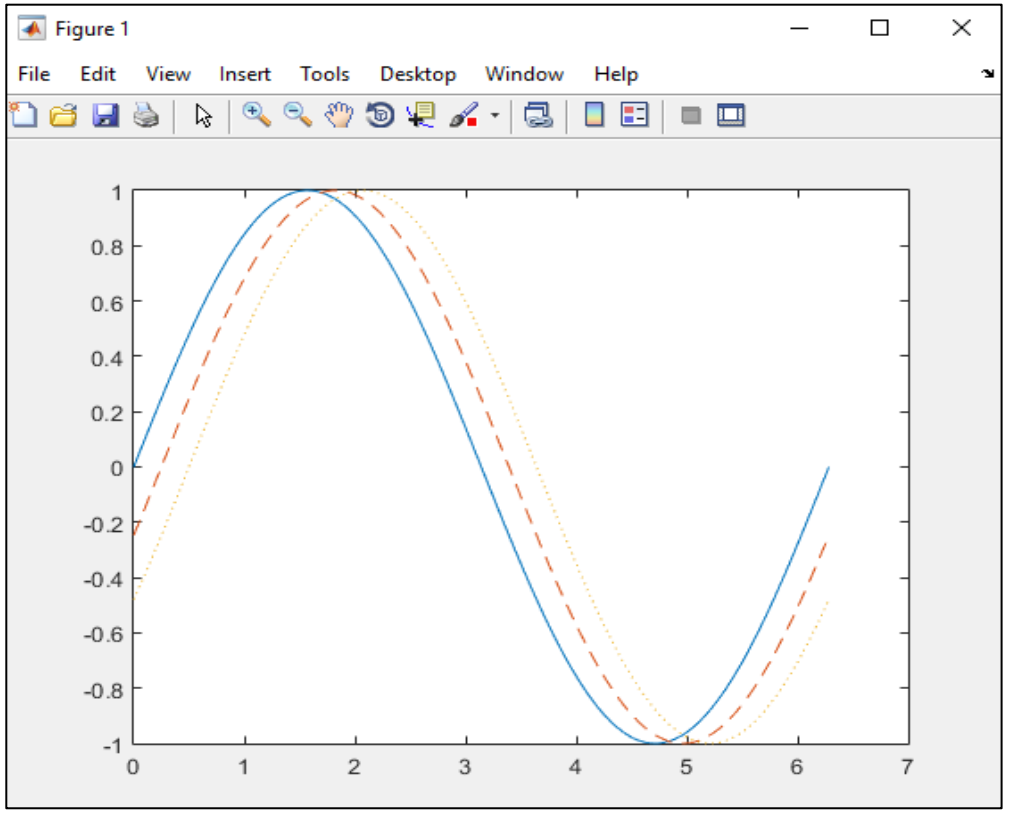


PLOTTING USING LINE STYLES

- Plot three sine curves with a small phase shift between each line.
- Use the default line style for the first line.
- Specify a dashed line style for the second line
- Specify a dotted line style for the third line.

Enter

```
x = 0:pi/100:2*pi;
y1 = sin(x);
y2 = sin(x-0.25);
y3 = sin(x-0.5);
plot(x,y1,x,y2,'--',x,y3,':')
```

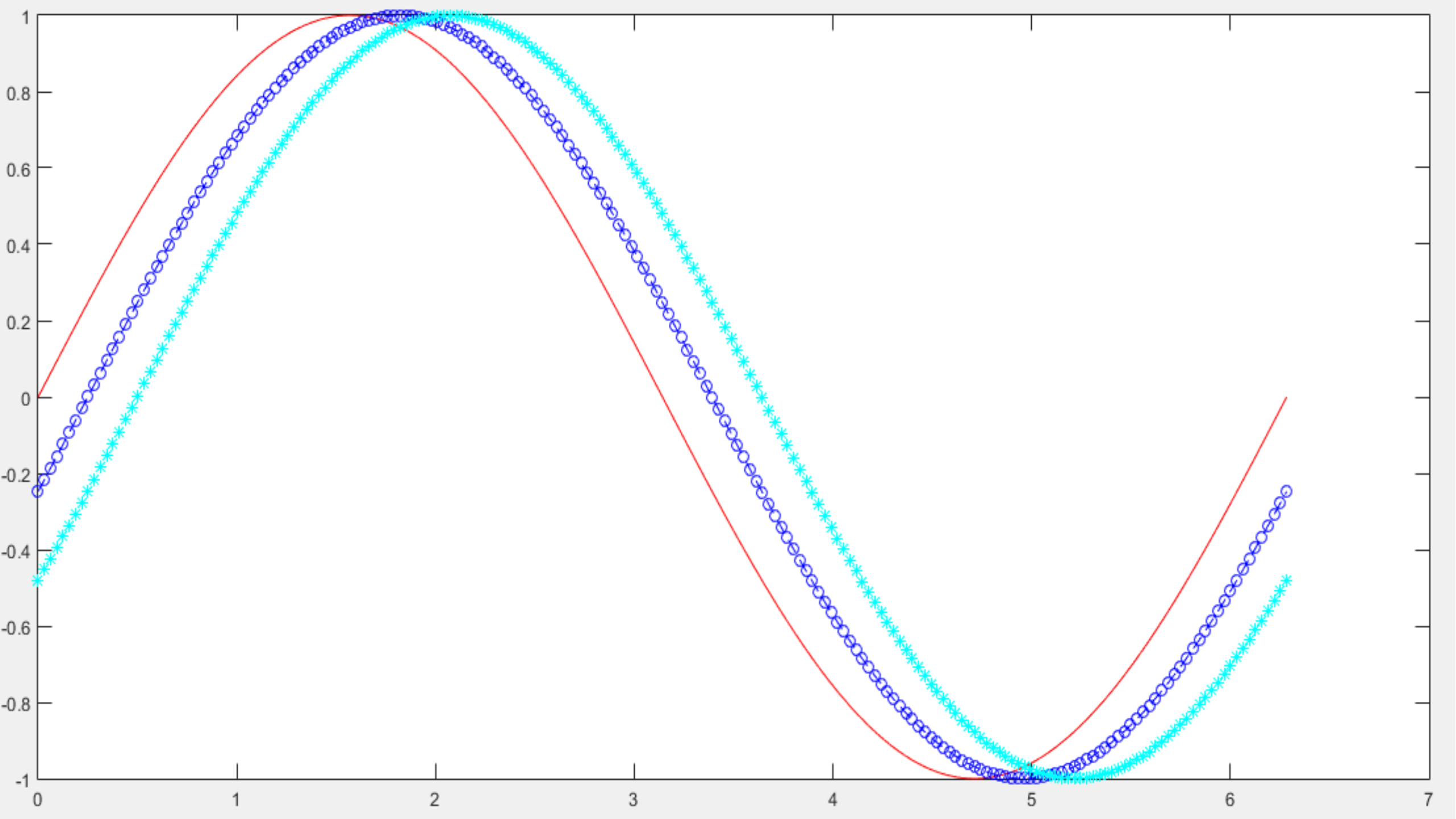


PLOTTING USING LINE STYLE, COLOUR & MARKER

- Plot three sine curves with a small phase shift between each signal.
- Use a red line with no markers for the first sine curve.
- Use a blue dashed line with circle markers for the second sine curve.
- Use only cyan star markers for the third sine curve.

ENTER

```
x = 0 : pi/10 : 2*pi;
y1 = sin(x);
y2 = sin(x-0.25);
y3 = sin(x-0.5);
plot(x,y1,‘r',x,y2,'b--o',x,y3,'c*')
```


1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1
2
3
4
5
6
7

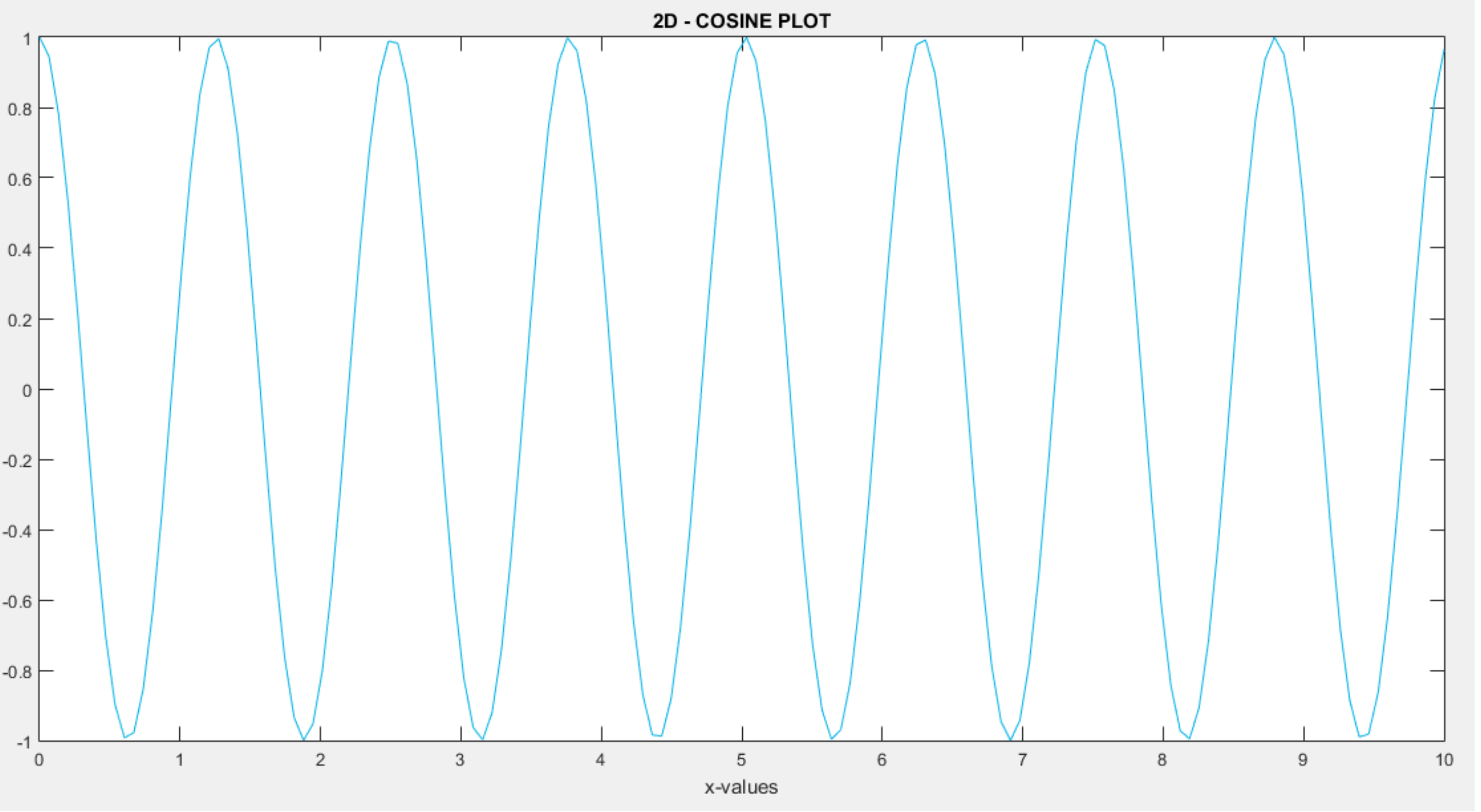
ADDING TITLE AND AXIS LABELS

Objective:

- Use the linspace function to define x as a vector of 150 values between 0 and 10. Define y as cosine values of x.
- Create a 2-D line plot of the cosine curve.
- Change the line color to a shade of blue-green using an RGB color value.
- Add a title and axis labels to the graph using the title, xlabel, and ylabel functions.

ENTER:

```
x = linspace(0,10,150);
y = cos(5*x);
plot(x,y,'Color',[0,0.7,0.9]);
title('2-D Line Plot');
xlabel('x-values');
ylabel('cos(5x)')
```

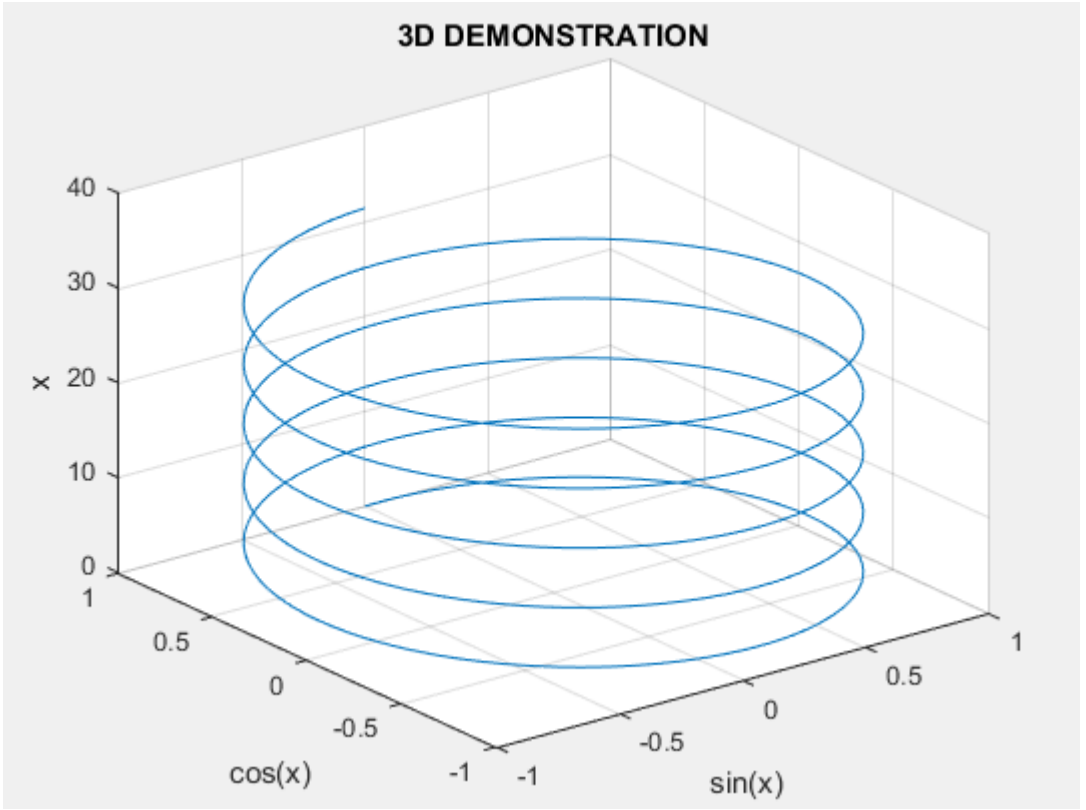

2D - COSINE PLOT
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1
0
1
2
3
4
5
6
7
8
9
10
x-values

PLOTTING 3D GRAPHS

- Define **x** as values between **0** and $\mathbf{10\pi}$.
- Define **st** and **ct** as vectors of sine and cosine values.
- Use **plot3** function to display graph.
- Label axes; insert title; and turn on grid.

ENTER

```
t = 0:pi/50:10*pi;
st =  sin(t);
ct = cos(t);
plot3(st, ct, t);
xlabel('sin(t)');
ylabel('cos(t)');
title('3D DEMONSTRATION')
```

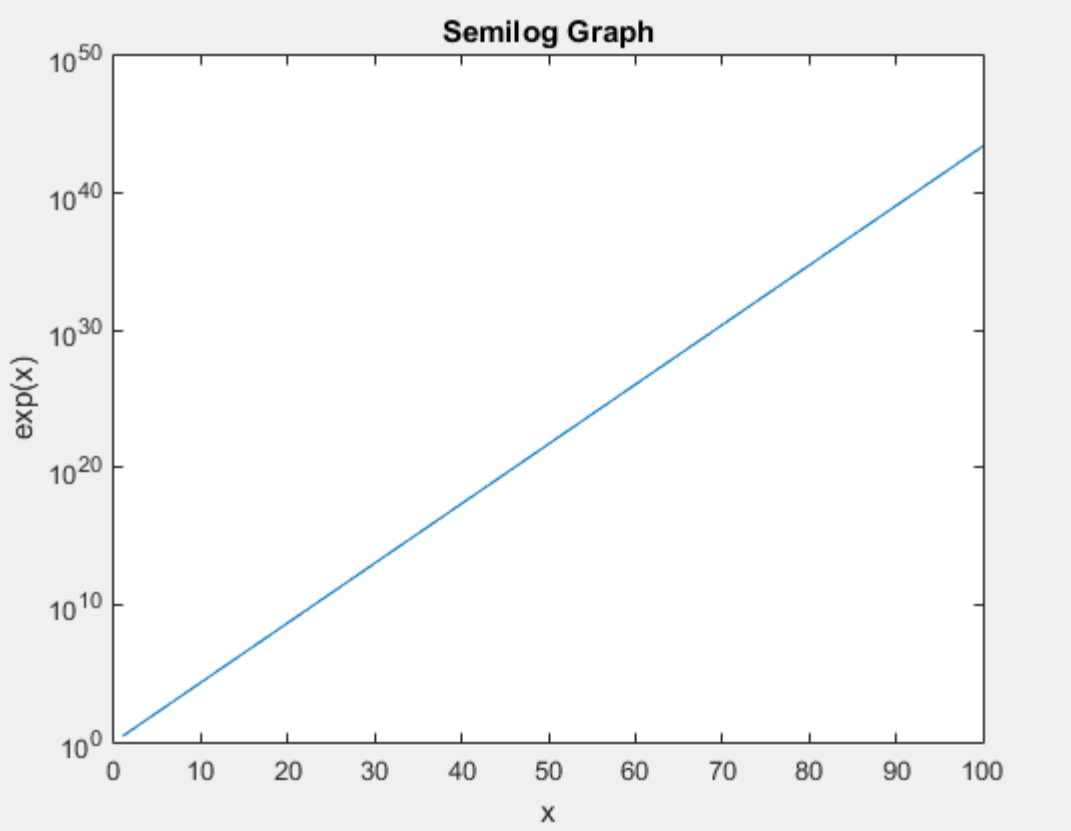


PLOTTING SEMILOG GRAPHS

Semillogy command is used to create a plot with a logarithmic scale for the y-axis and a linear scale for the x-axis.

ENTER

```
x = 1:100;
y = exp(x);
Semilogy(x,y);
xlabel('x');
ylabel('exp(x)');
title('Semilog Graph')
```

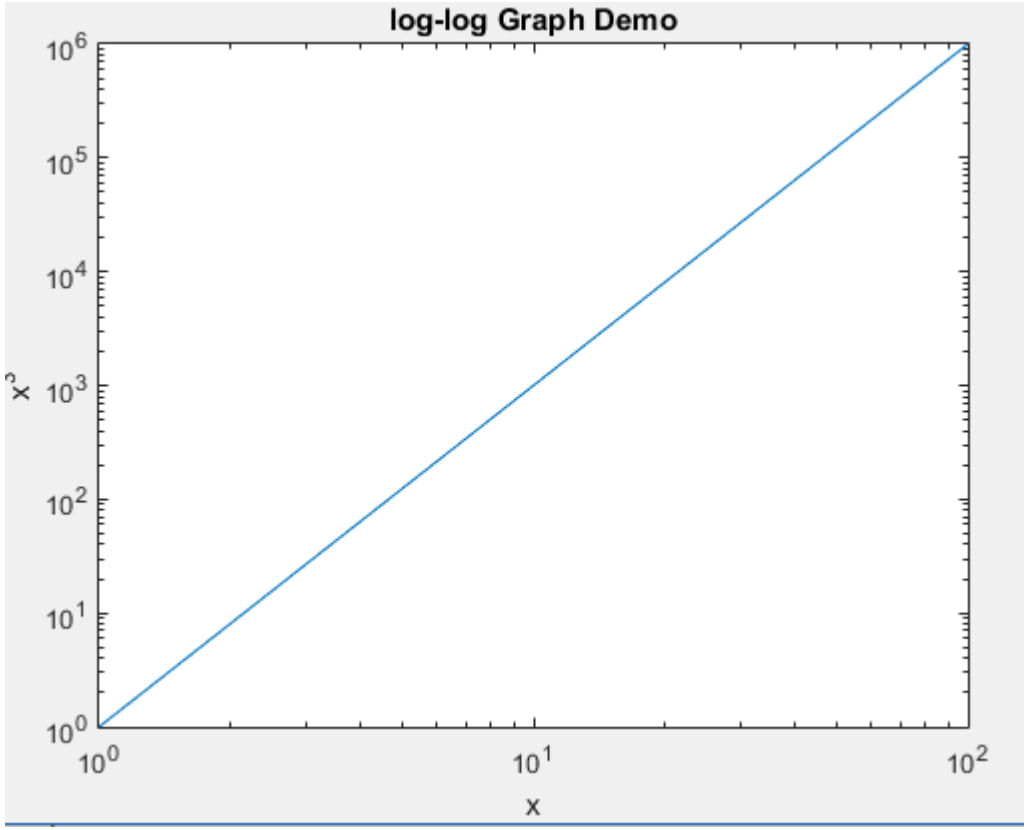


PLOTTING LOG-LOG GRAPH

Used to create a plot with a logarithmic scale on both y-axis.

ENTER:

```
x=1:100;
y=x.^3;
loglog(x,y)
xlabel('x');
ylabel('x^3');
title('log-log Graph Demo')
```



USING SURF FUNCTION

surf(X,Y,Z) plots the values in matrix Z as heights above a grid in the x-y plane defined by X and Y.

Z is used for the colour data, so colour is proportional to height.

ENTER

```
x = 1:0.5:10;
y = 1:20;
[X,Y] = meshgrid(x,y);
Z = sin(X) + cos(Y);
C = X.*Y;
surf(X,Y,Z,C)
colorbar
```