

14-Plots

text: Chapter 5.1-5.2

ECEGR 101

Engineering Problem Solving with Matlab

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Overview

- Single Plots
- Line properties
- fplot

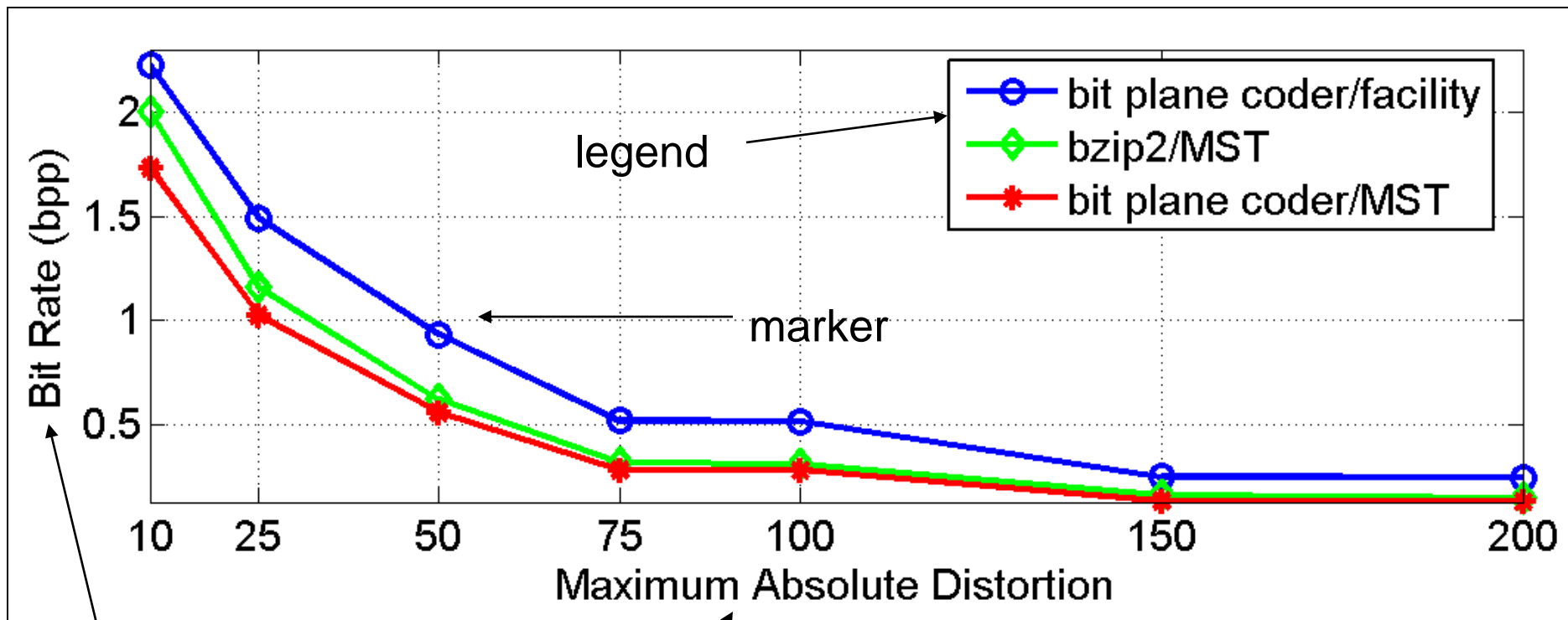


Creating Plots

- Visual display of data is an important part of technical communication
- MATLAB can be used to create a wide range of custom graphs and plots



Example of a MATLAB Plot

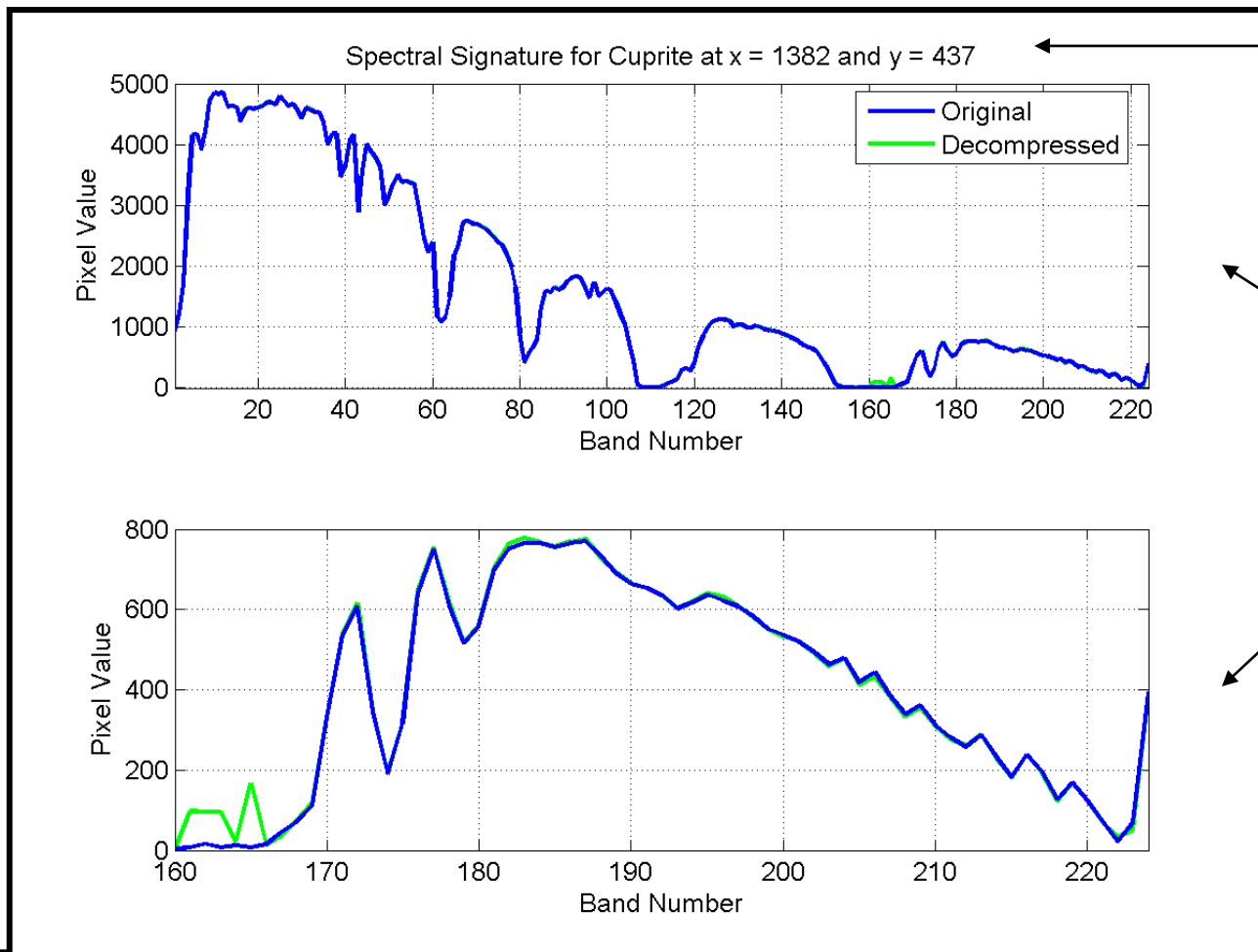


Y axis label

X axis label



Example of a MATLAB Plot



← title

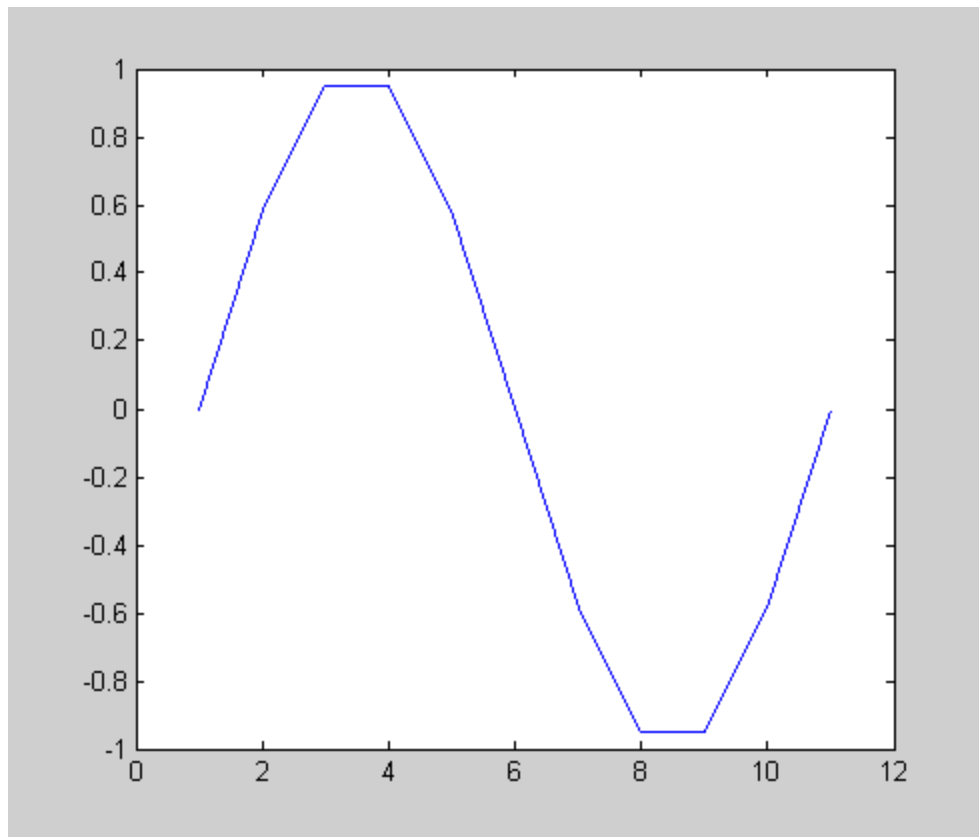
← subplots



The Plot Command

`plot(x)`

- plots vector x against an index



```
>> x = 0:pi/5:2*pi;
```

```
>> y = sin(x);
```

```
>> plot(y)
```

```
>> length(y)
```

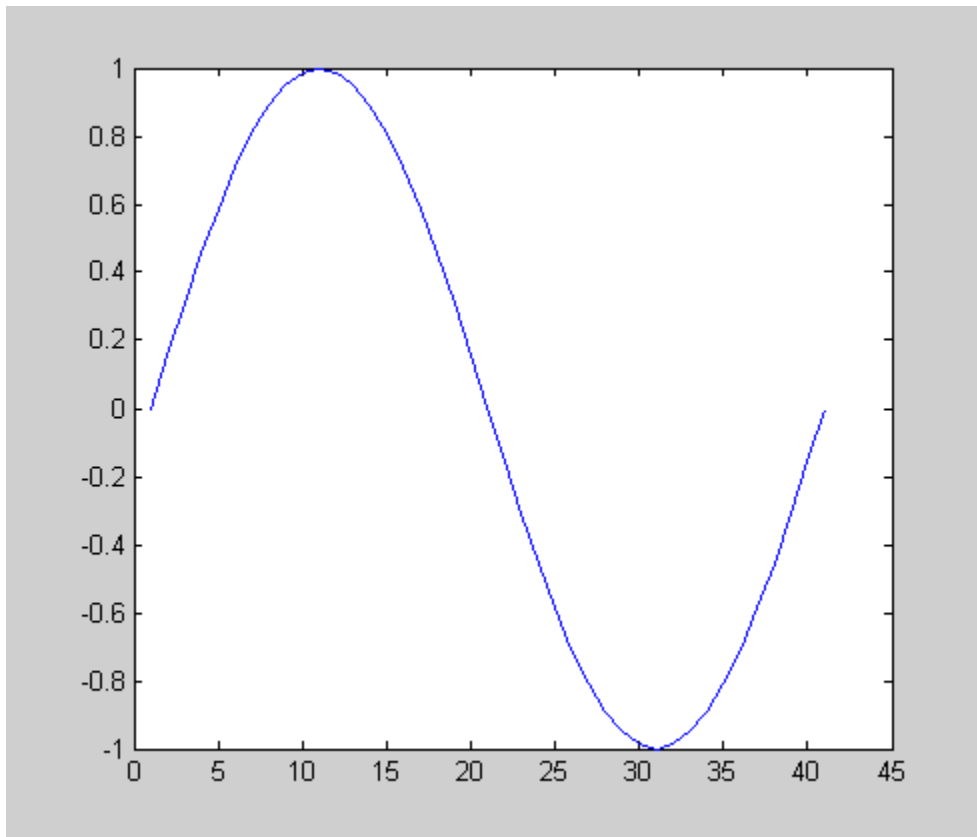
```
ans =
```

```
11
```

Note: MATLAB draws straight Lines between data points.



The Plot Command



```
>> x = 0:pi/20:2*pi;  
>> y = sin(x);  
>> plot(y)
```

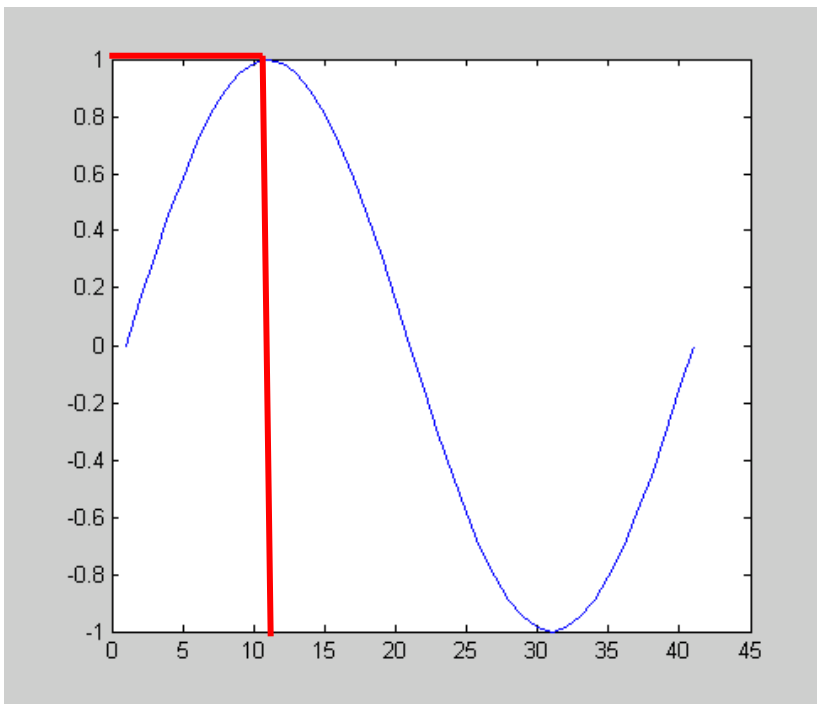
```
>> length(y)  
ans =  
    41
```

Decrease interval spacing for a smoother appearance.



The Plot Command

- When using `plot(y)`, the x-axis is indexed starting at 1 and increases to `numel(y)` in increments of 1
- This is usually incorrect and can be confusing



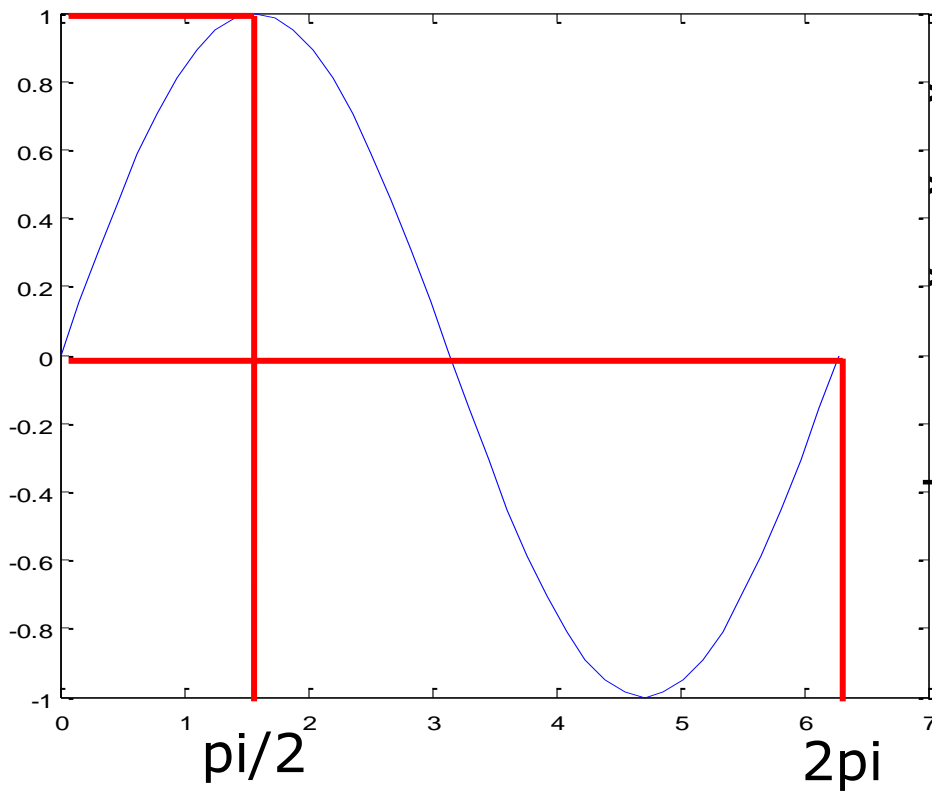
$\sin(11) = 1?$
No!

We really should plot y versus x



The Plot Command

plot(x,y) - plots vector y against vector x



```
> x = 0:pi/5:2*pi;  
> y = sin(x);  
> plot(x,y)
```

The plot makes more sense now



The Plot Command

Example: Plot the function $y=x^2-10x+15$ for values of x between 0 and 10.

```
Editor - C:\Documents and Settings\...
File Edit Text Cell Tools Debug De
[Icons: New, Open, Save, Cut, Copy, Paste, Undo, Redo, Print]
1 % Plot example 1
2
3 - x = 0:10;
4 - y = x.^2 - 10*x + 15;
5 - plot(x,y)
6
7
```

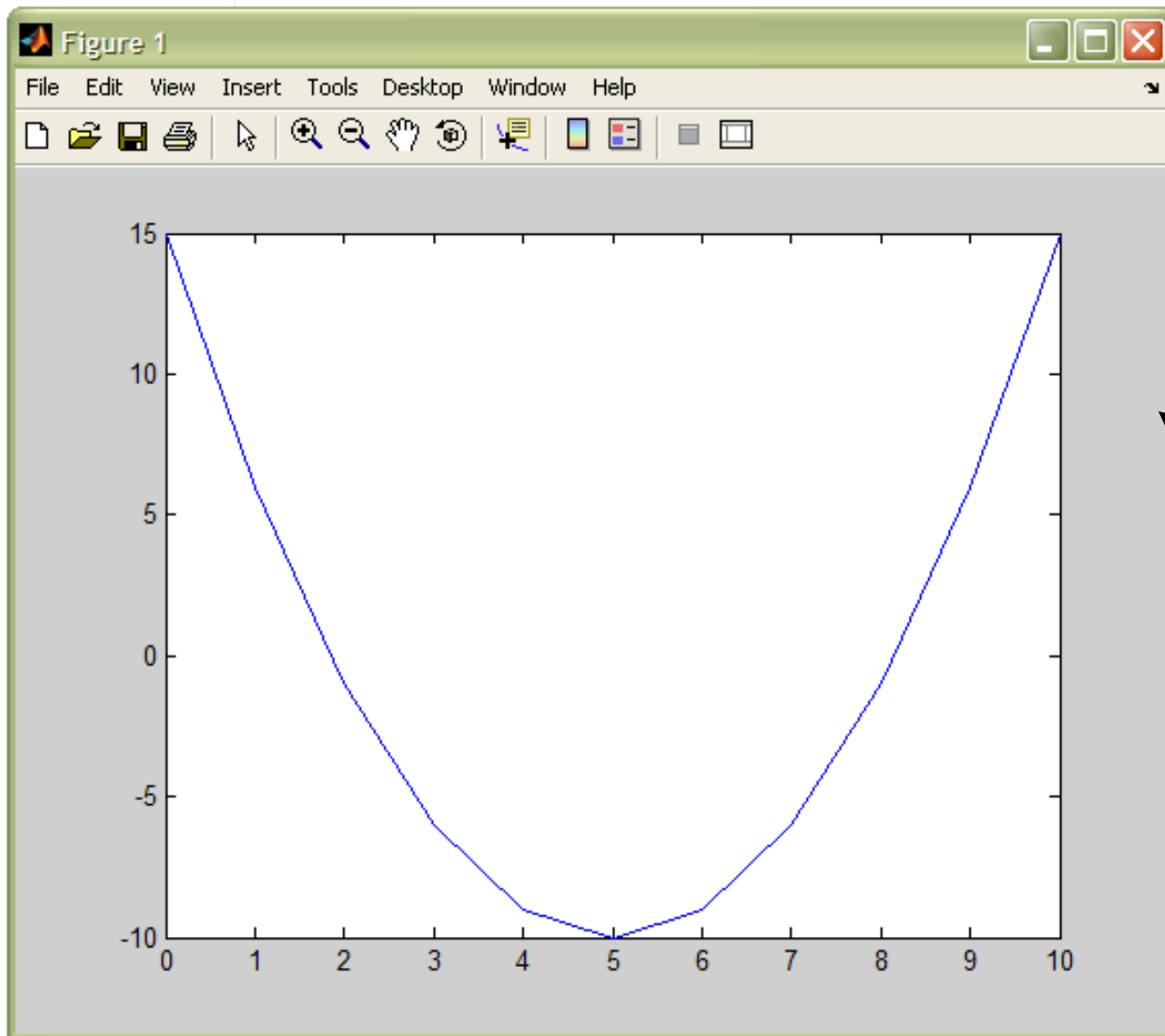


Figure Window



The Figure Command

figure(n) opens a new figure window if it is not already open.

n – figure number

```
% Plot example 2
```

```
x = 0:0.01:10;
```

```
y1 = x.^2 - 10*x + 15;
```

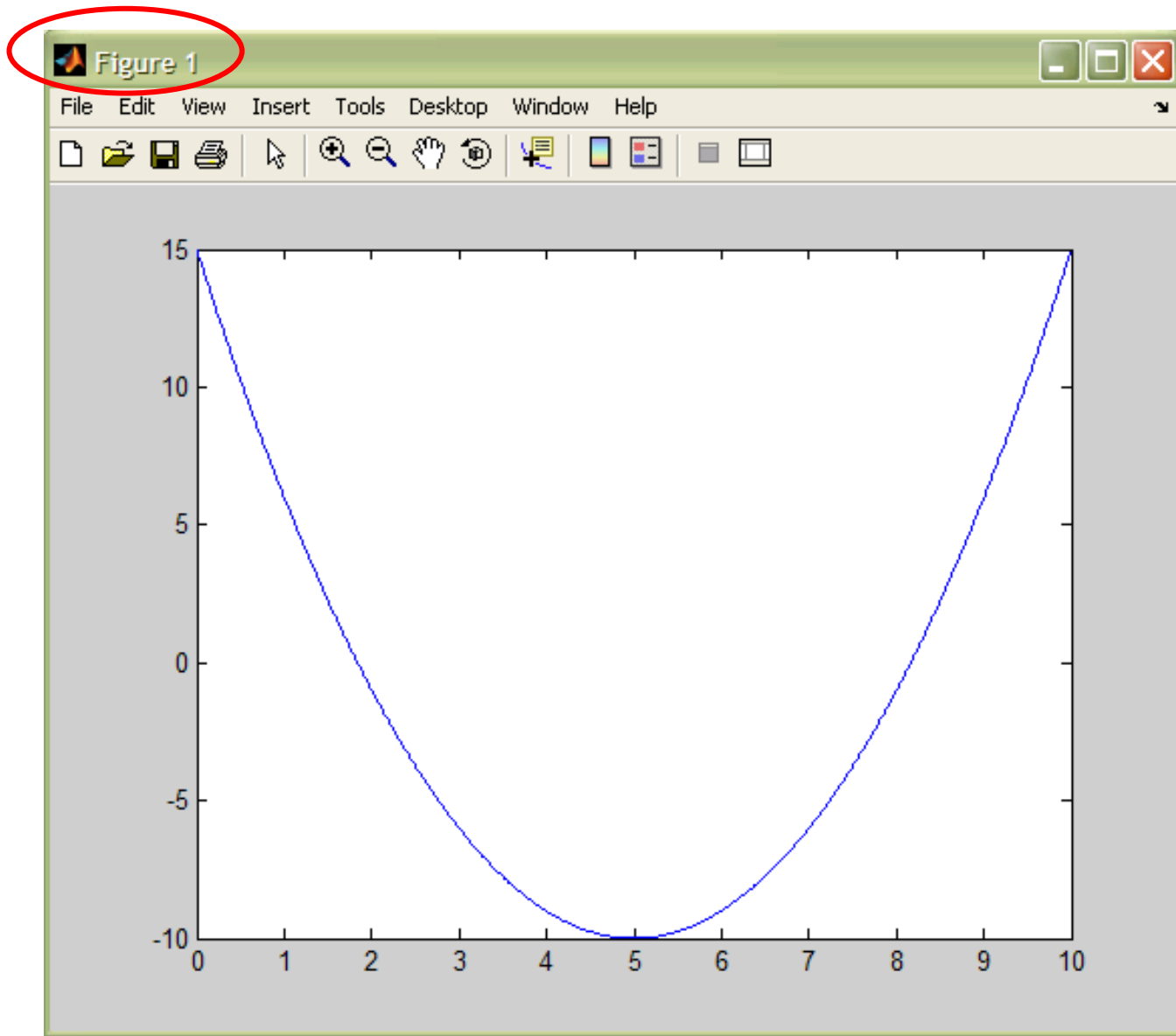
```
figure(1)
```

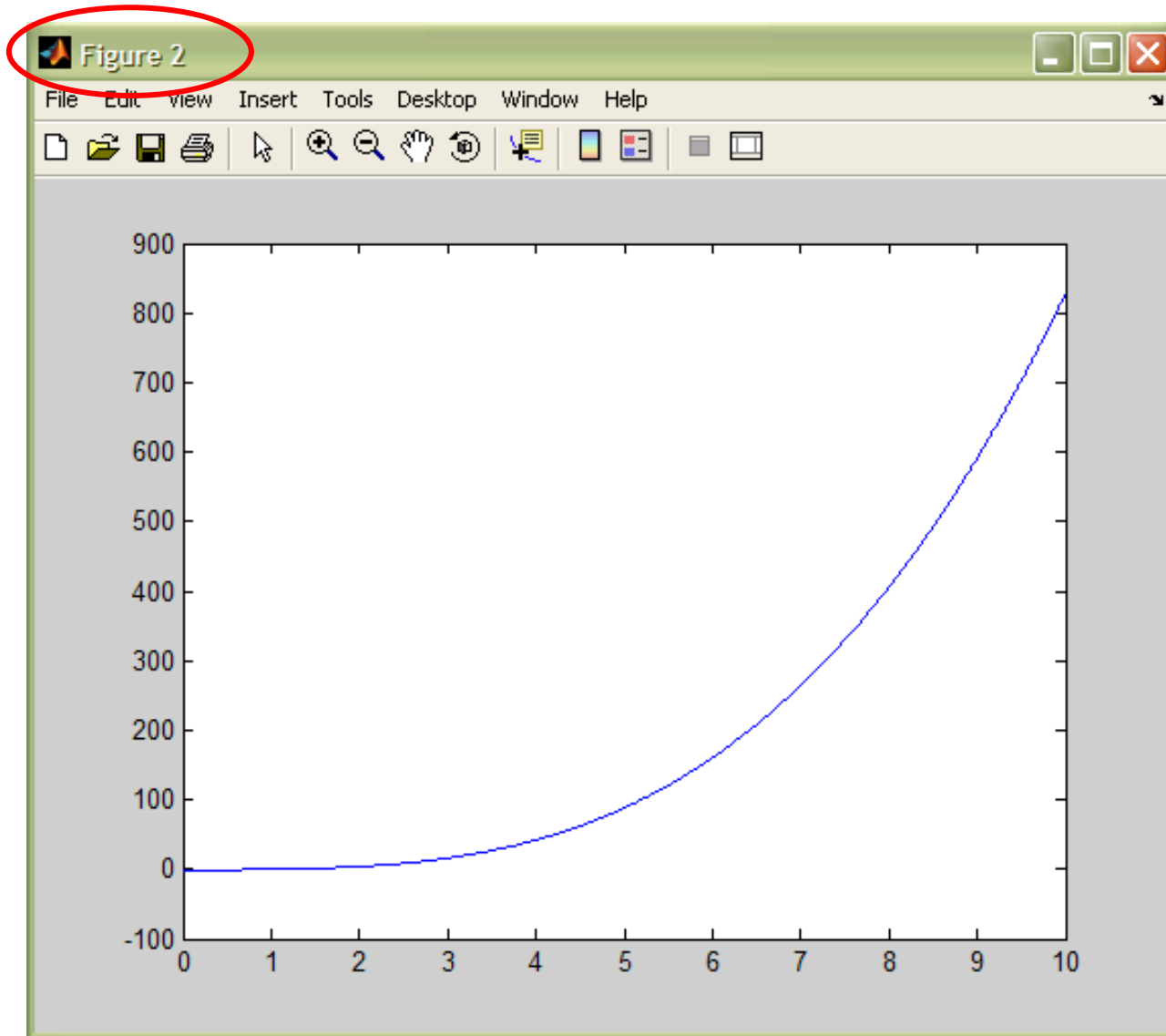
```
plot(x, y1)
```

```
y2 = x.^3 - 2*x.^2 + 3*x - 2;
```

```
figure(2)
```

```
plot(x, y2)
```







Exercise

Create a new m-file and use the plot command to plot $\sin(x)$ versus x for the values of x between 0 and 3π in increments of $\pi/20$.



Exercise

% Exercise 1

```
x = 0 : pi/20 : 3*pi;
```

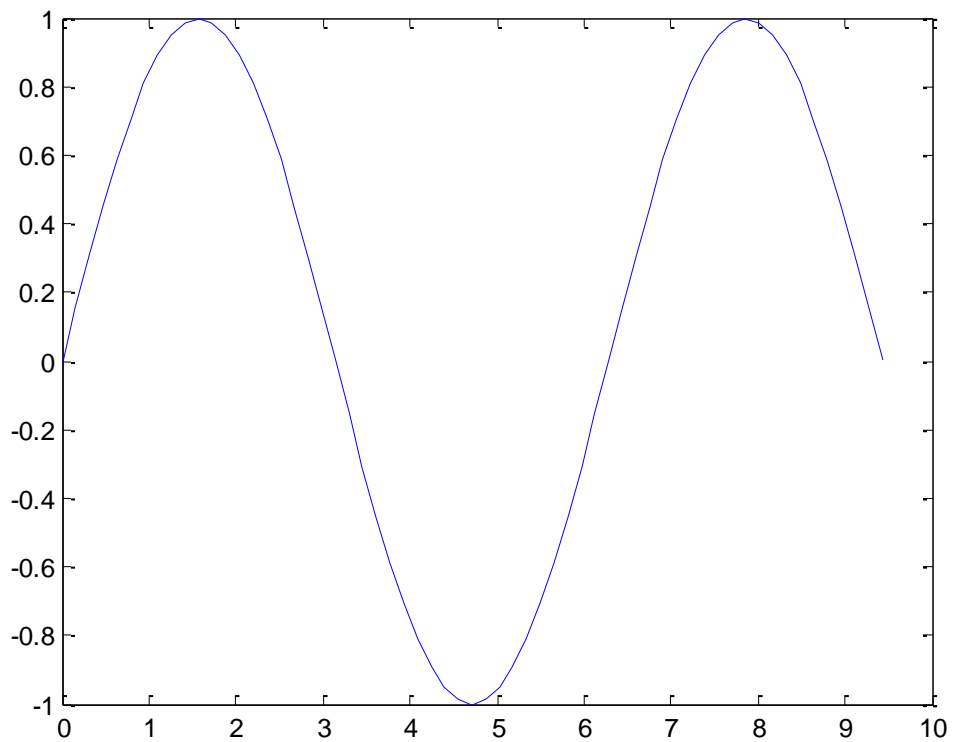
```
y = sin(x);
```

```
figure(1)
```

```
plot(x,y);
```




Exercise





Line and Marker Control

```
plot(x,y, 'line specifiers');
```

defines style and color of the line and markers (optional, up to three characters)

Line Type:

- solid
- dashed
- : dotted
- . dash-dot

Color:

- r red
- g green
- b blue
- c cyan
- m magenta
- y yellow
- k black
- w white

Marker Type:

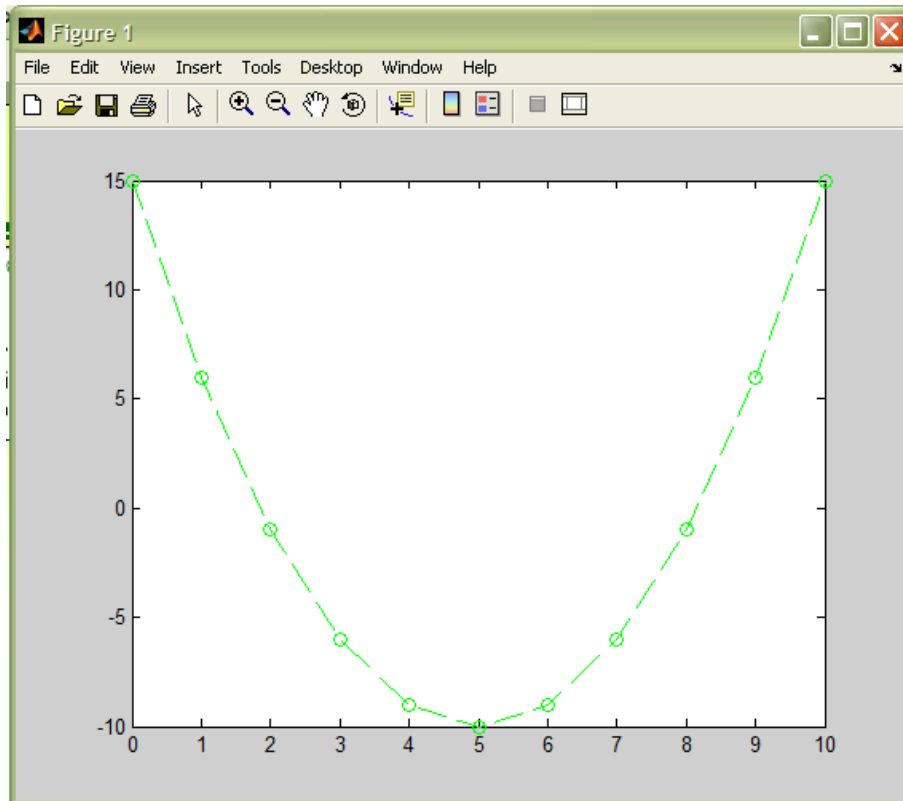
- + o * .
- s square
- d diamond
- p pentagram
- h hexagram



Example

```
% Plot example 3
```

```
x = 0:10;  
y = x.^2 - 10*x + 15;  
figure(1)  
plot(x, y, 'g--o')
```

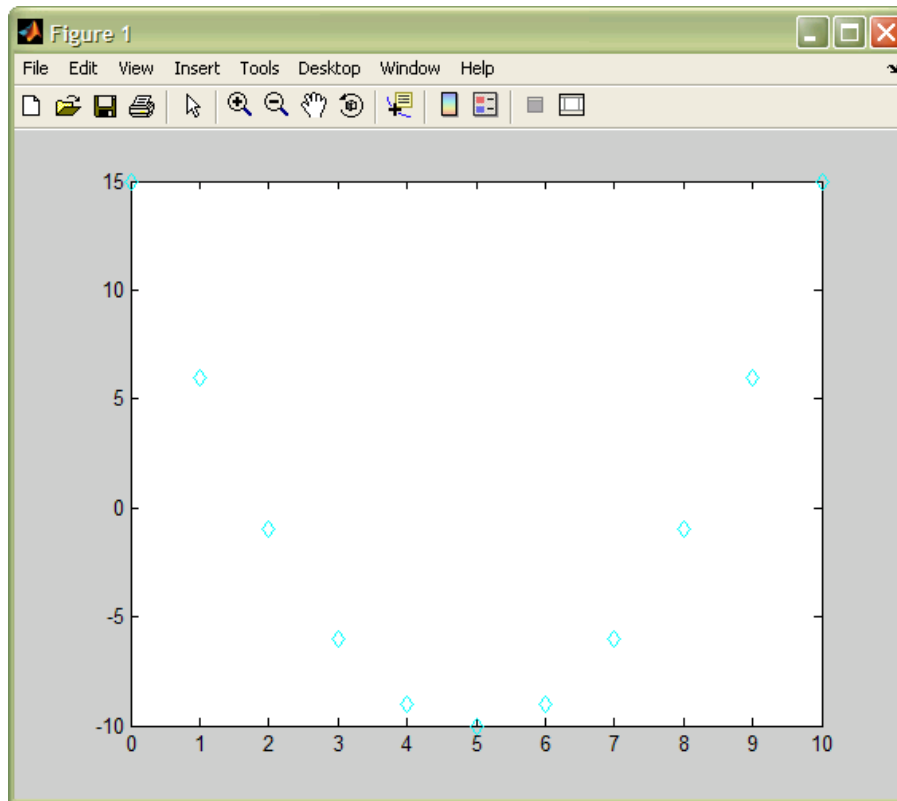




Example

```
% Plot example 4
```

```
x = 0:10;  
y = x.^2 - 10*x + 15;  
figure(1)  
plot(x, y, 'cd')
```





Exercise

Let

```
>>x = 0 : pi/20 : 3*pi;
```

```
>>y = sin(x);
```

Try using the following commands to change the appearance of the plot

```
>>figure(1); plot(x,y,'*-')
```

```
>>figure(2); plot(x,y,'o:')
```



Exercise

% Exercise 2

```
x = 0 : pi/20 : 3*pi;
```

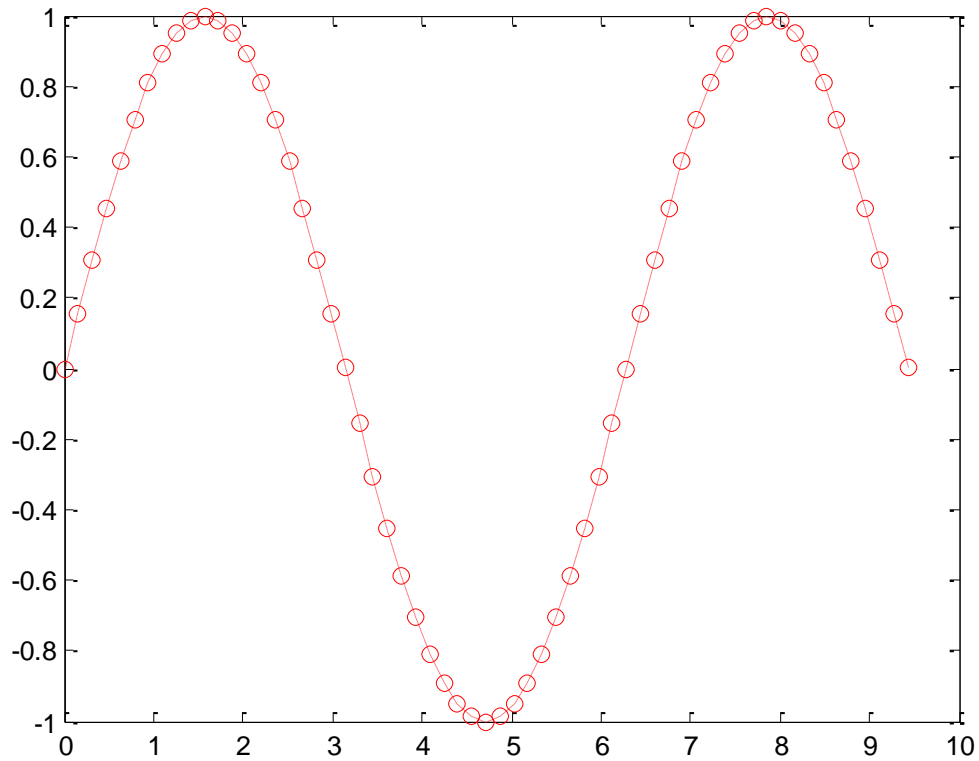
```
y = sin(x);
```

```
figure(1)
```

```
plot(x,y, 'o:r');
```



Exercise





More Line and Marker Control

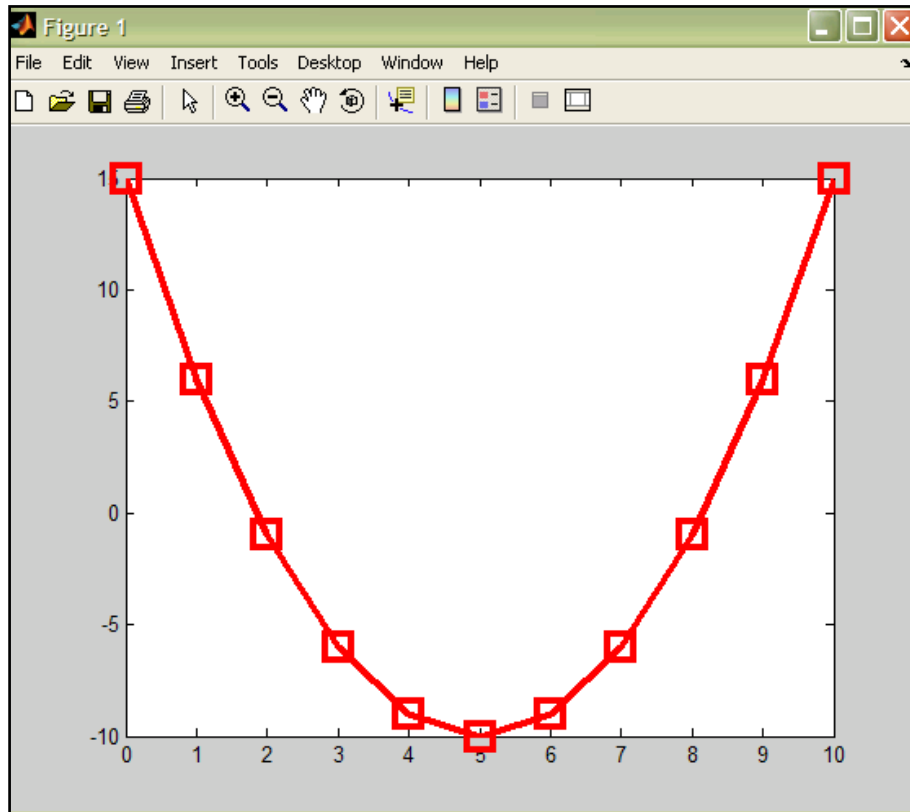
```
plot(x,y, 'line specifiers', 'PropertyName',  
'PropertyValue');
```

defines thickness of the line, size of the markers, color of the marker's edge and fill (optional)

PropertyName:	LineWidth
	MarkerSize
	MarkerEdgeColor
	MarkerFaceColor



Example



```
% Plot example 4
```

```
x = 0:10;
```

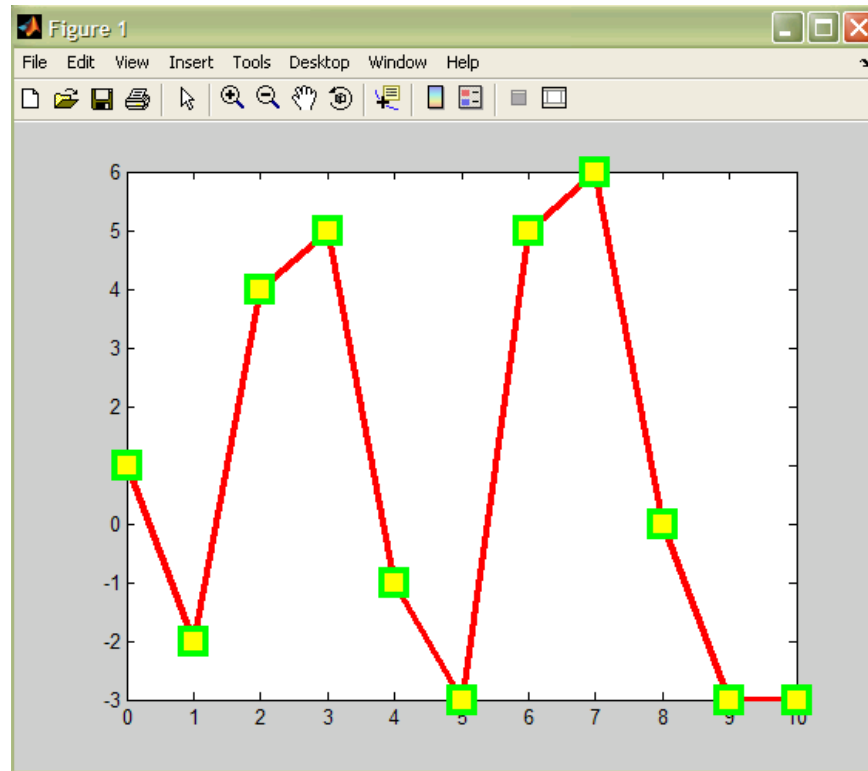
```
y = x.^2 - 10*x + 15;
```

```
figure(1)
```

```
plot(x, y, 'r-s', 'LineWidth', 3, 'MarkerSize', 15)
```



Example



```
% Plot example 5
```

```
x = 0:10;
```

```
y = [1 -2 4 5 -1 -3 5 6 0 -3 -3];
```

```
figure(1)
```

```
plot(x, y, 'r-s', 'LineWidth', 3, 'MarkerSize', 15, 'MarkerEdge', 'g', 'MarkerFaceColor', 'y')
```



Exercise

Create a new m-file and use the plot command to plot $\sin(x)$ versus x for the values of x between 0 and 3π in increments of 0.1π .

Try any of the line and marker controls on the $\sin(x)$ plot.



Exercise

% Exercise 3

```
x = 0 : pi/20 : 3*pi;
```

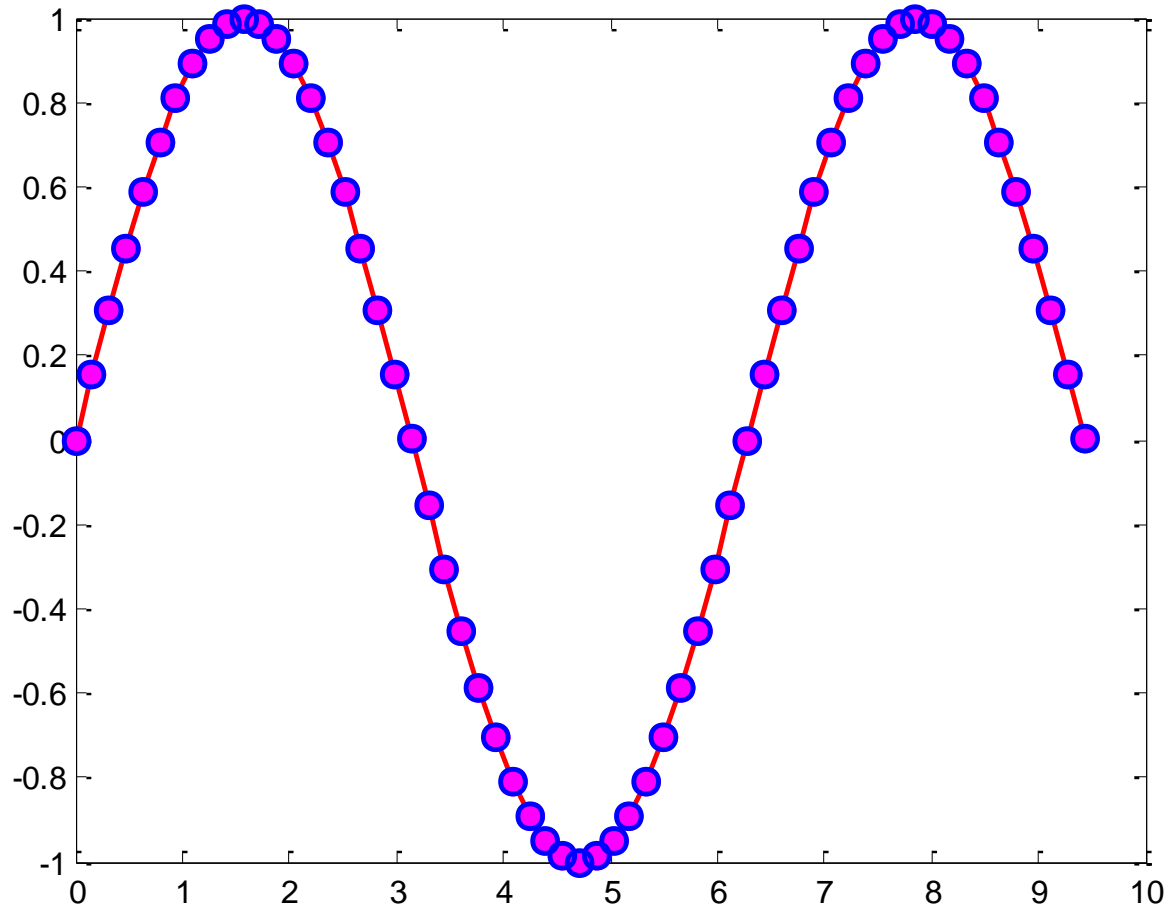
```
y = sin(x);
```

```
figure(1)
```

```
plot(x,y, 'o-r', 'LineWidth', 2, 'MarkerSize', 8,  
      'MarkerEdge', 'b', 'MarkerFaceColor', 'm');
```



Exercise





fplot Command

Plots a function $y = f(x)$ between given limits

`fplot('function', limits, 'line specifiers')`

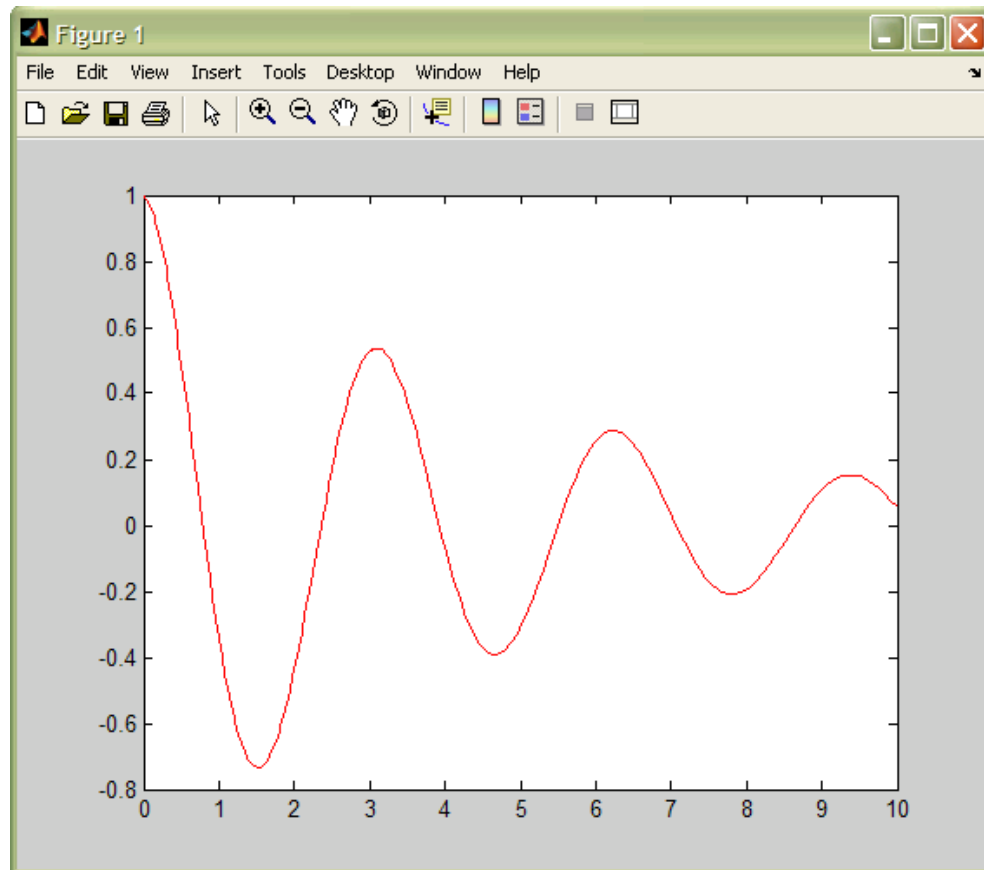
Function typed as
a string.

Function
support.

```
fplot('(exp(-0.2*t))*cos(2*t)', [0 10], 'r-')
```



Example



```
fplot('(exp(-0.2*t))*cos(2*t)', [0 10], 'r-')
```