

Important Commands

syms - Create symbolic variables and functions

```
syms x y
```

simplify - Algebraic simplification

```
syms x y  
y = x^2 + 6*x + 9
```

$$y = x^2 + 6x + 9$$

```
simplify(y)
```

$$\text{ans} = (x + 3)^2$$

```
syms x y  
y = 2 * (x + 3)^2 / (x^2 + 6*x + 9)
```

$$y = \frac{2(x + 3)^2}{x^2 + 6x + 9}$$

```
simplify(y)
```

$$\text{ans} = 2$$

```
syms x  
equ = y == 2 * (x + 3)^2 / (x^2 + 6*x + 9)
```

$$\text{equ} = \frac{2(x + 3)^2}{x^2 + 6x + 9} = \frac{2(x + 3)^2}{x^2 + 6x + 9}$$

```
simplify(equ)
```

$$\text{ans} = \text{TRUE}$$

```
syms y1 y2 x  
y1 = (x+1)^2
```

$$y1 = (x + 1)^2$$

```
y2 = x^2 + 2*x + 1
```

$$y2 = x^2 + 2x + 1$$

```
if simplify(y1) == simplify(y2)
    disp('y1 EQUALS y2')
else
    disp('y1 NOT EQUALS y2')
end
```

y1 EQUALS y2

expand - multiply out the polynomial

```
syms x y
y = (x + 3)^2
```

$$y = (x + 3)^2$$

```
expand(y)
```

$$\text{ans} = x^2 + 6x + 9$$

```
syms x y
equ = (x+2)^3 == (x+3)^2
```

$$\text{equ} = (x + 2)^3 = (x + 3)^2$$

```
expand(equ)
```

$$\text{ans} = x^3 + 6x^2 + 12x + 8 = x^2 + 6x + 9$$

```
simplify(equ)
```

$$\text{ans} = (x + 2)^3 = (x + 3)^2$$

solve - Equations and systems solver

```
solve((x-2),x)
```

$$\text{ans} = 2$$

```
syms x
eqn = sin(x) == 1;
```

```
solx = solve(eqn,x)
```

```
solx =
```

$$\frac{\pi}{2}$$

```
syms x y
```

```
equ = x == 2 * y
```

```
equ = x = 2 y
```

```
solve(equ, y)
```

```
ans =
```

$$\frac{x}{2}$$

factor

```
syms y x
```

```
y = x^2 + 5*x + 6
```

```
y = x^2 + 5 x + 6
```

```
factor(y,x)
```

```
ans = (x + 3) (x + 2)
```

```
expand((x+3)*(x+2))
```

```
ans = x^2 + 5 x + 6
```

collect - Collect coefficient

```
syms y x z
```

```
y = 2*x^2 + 6*x + 9 + x^2 + 2*x*z + z^2
```

$$y = 3x^2 + 2xz + 6x + z^2 + 9$$

```
collect(y,x)
```

$$\text{ans} = 3x^2 + (2z + 6)x + z^2 + 9$$

```
collect(y,z)
```

$$\text{ans} = z^2 + (2x)z + 3x^2 + 6x + 9$$

```
syms y x z
```

```
equ = y + (x+2)^2 + x + z == (x+3)^2 + (x+z)^2
```

$$\text{equ} = x + y + z + (x + 2)^2 = (x + 3)^2 + (x + z)^2$$

```
expand(equ)
```

$$\text{ans} = x^2 + 5x + y + z + 4 = 2x^2 + 2xz + 6x + z^2 + 9$$

```
collect(equ,x)
```

$$\text{ans} = x^2 + 5x + y + z + 4 = 2x^2 + (2z + 6)x + z^2 + 9$$

subs - Symbolic substitution

```
syms a b
y = a + b
```

$$y = a + b$$

```
subs(y, a, 4)
```

$$\text{ans} = b + 4$$

poly2sym - Create symbolic polynomial from vector of coefficients

```
A = [3 2 9]
```

$$A = 1 \times 3$$

$$\begin{matrix} 3 & 2 & 9 \end{matrix}$$

```
y = poly2sym(A,z)
```

$$y = 3z^2 + 2z + 9$$

sym2poly - Extract vector of all numeric coefficients, including zeros, from symbolic polynomial

```
syms x y
```

```
y = 3*x^3 + 5*x^2 + 2*x + 9
```

$$y = 3x^3 + 5x^2 + 2x + 9$$

```
B = sym2poly(y)
```

$$B = \begin{matrix} 1 \times 4 \\ 3 & 5 & 2 & 9 \end{matrix}$$

plot - 2-D line plot

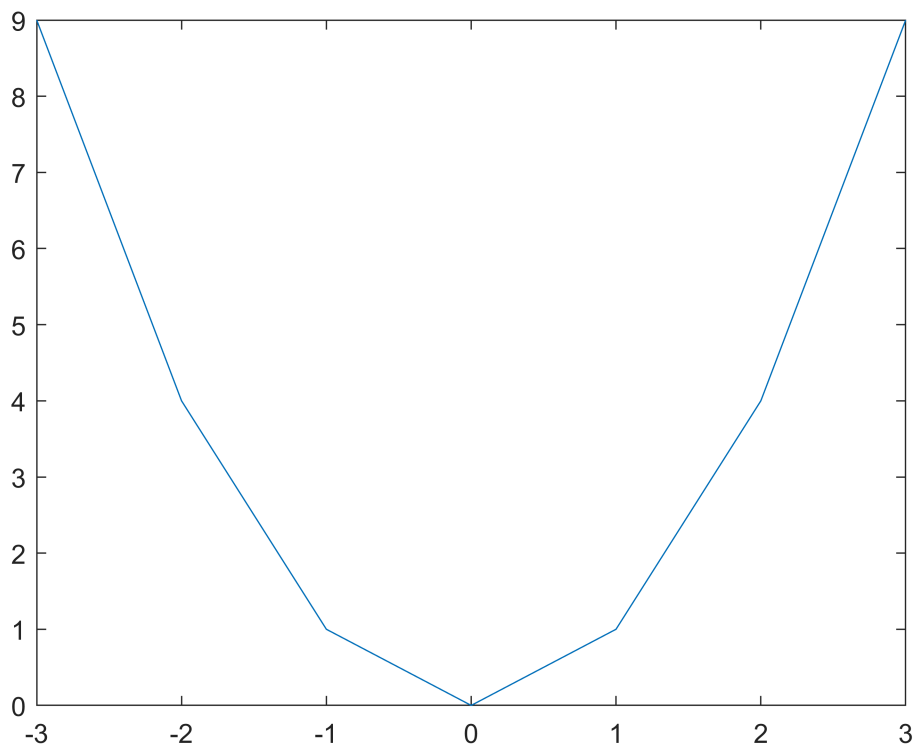
```
x = [ -3 -2 -1 0 1 2 3]
```

$$x = \begin{matrix} 1 \times 7 \\ -3 & -2 & -1 & 0 & 1 & 2 & 3 \end{matrix}$$

```
y = x.^2
```

$$y = \begin{matrix} 1 \times 7 \\ 9 & 4 & 1 & 0 & 1 & 4 & 9 \end{matrix}$$

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



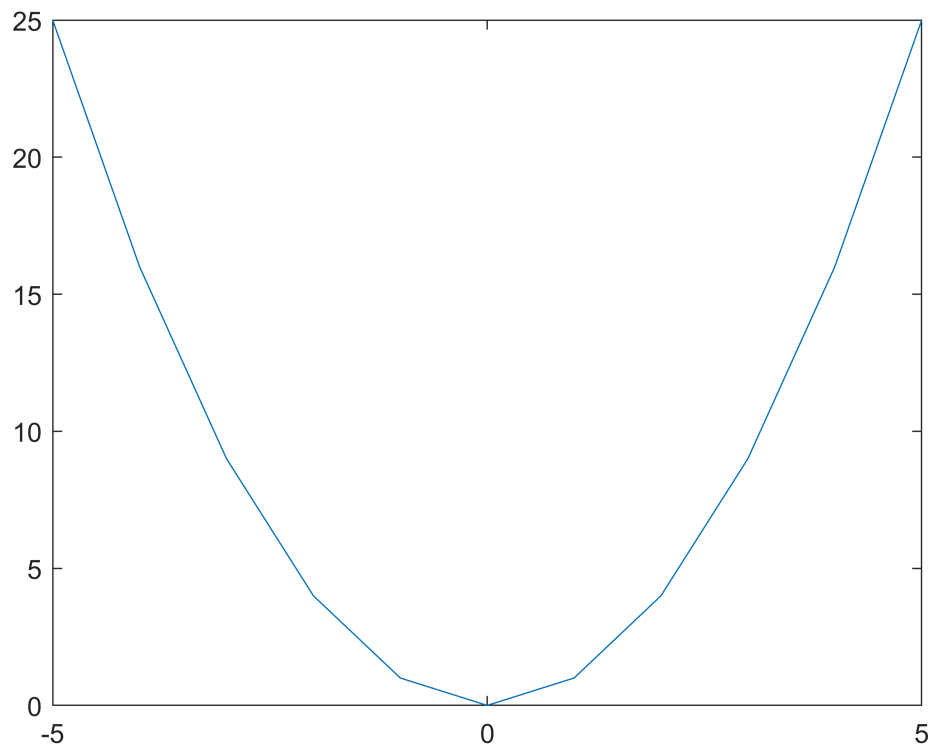
```
x = -5:1:5
```

```
x = 1x11  
    -5    -4    -3    -2    -1     0     1     2     3     4     5
```

```
y = x.^2
```

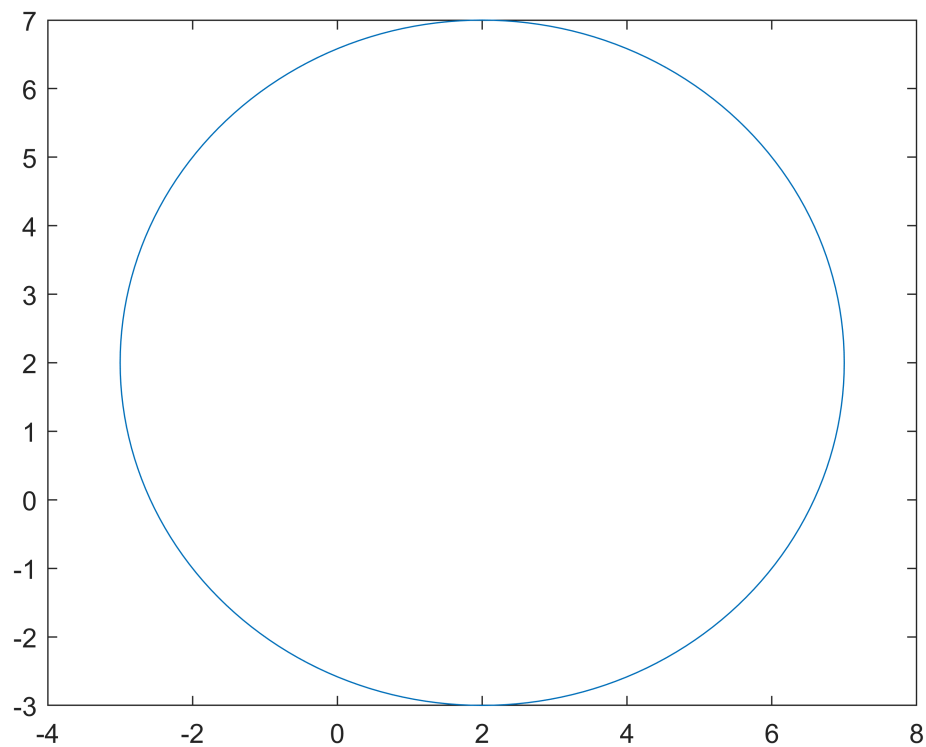
```
y = 1x11  
    25    16     9     4     1     0     1     4     9    16    25
```

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



Plotting a circle

```
x = 1;  
y = 2;  
r = 5;  
th=0:pi/100:2*pi;  
a = r*cos(th)+x;  
b = r*sin(th)+y;  
plot(a,b)
```



Plotting many lines on the same plot

```
x=1:10
```

```
x = 1×10
     1     2     3     4     5     6     7     8     9    10
```

```
y1=x
```

```
y1 = 1×10
     1     2     3     4     5     6     7     8     9    10
```

```
figure;
plot(x,y1,'r')
title('y VS y'),xlabel('x'),ylabel('y')
y2=2*x
```

```
y2 = 1×10
     2     4     6     8    10    12    14    16    18    20
```

```
hold on;
plot(x,y2,'g')
hold off;
legend('y=x','y=2x')
```