```
% Symbolic stuff 3
clc, clear
syms x y z
z = (x^2 - y^2)*(x-y)
```

$z = (x^2 - y^2)(x - y)$

```
expand(z)
```

$ans = x^3 - x^2 y - x y^2 + y^3$

```
factor(z)
```

$ans = (x - y \quad x - y \quad x + y)$

```
collect(z, x)
```

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

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

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

```
y = cos(3*acos(x))
```

$y = \cos(3 \arccos(x))$

```
solve(y, x)
```

$$ans = \begin{pmatrix} 0 \\ -\dfrac{\sqrt{3}}{2} \\ \dfrac{\sqrt{3}}{2} \end{pmatrix}$$

```
% Sym2poly and poly2sym

a = [3, 2, 9]
```

a = 1×3
   3   2   9

```
Y = poly2sym(a)
```

$Y = 3 x^2 + 2 x + 9$

```
syms x
eqn = x^2 + 2*x
```

1

eqn = $x^2 + 2\,x$

```
n = sym2poly(eqn)
```

n = 1×3
    1   2   0

```
eq2 = (x+1)^3
```

eq2 = $(x+1)^3$

```
n2 = sym2poly(eq2)
```

n2 = 1×4
    1   3   3   1

```
% Systems of eqns
clc, clear
syms x y z

tic
eq1 = x + y == 6
```

eq1 = $x + y = 6$

```
eq2 = x - y == 4
```

eq2 = $x - y = 4$

```
bruh = solve(eq1, eq2)
```

bruh = *struct with fields:*
    x: [1×1 sym]
    y: [1×1 sym]

```
toc
```

Elapsed time is 0.155225 seconds.

```
bruh.x
```

ans = 5

```
bruh.y
```

ans = 1

```
xval = double(bruh.x)
```

xval = 5

```
yval = double(bruh.y)
```

yval = 1

Another way to solve it

```
% use tic toc to time a process
tic
A = [1  1  6;
     1 -1  4]
```

```
A = 2×3
     1     1     6
     1    -1     4
```

```
ans2 = rref(A)
```

```
ans2 = 2×3
     1     0     5
     0     1     1
```

```
toc
```

```
Elapsed time is 0.007698 seconds.
```

```
eq1 =     x + 5*y - 2*z == 23
```

eq1 = $x + 5\,y - 2\,z = 23$

```
eq2 =    -x + 3*y - 8*z == 11
```

eq2 = $3\,y - x - 8\,z = 11$

```
eq3 = -4*x - 2*y + 6*z == 6
```

eq3 = $6\,z - 2\,y - 4\,x = 6$

```
sys2 = solve(eq1, eq2, eq3)
```

```
sys2 = struct with fields:
    x: [1×1 sym]
    y: [1×1 sym]
    z: [1×1 sym]
```

```
sys2.x, sys2.y, sys2.z
```

ans =

$$-\frac{111}{41}$$

ans =

$$\frac{228}{41}$$

ans =

$$\frac{43}{41}$$

```
A = [ 1  5 -2  23;
     -1  3 -8  11;
     -4 -2  6   6]
```

```
A = 3×4
     1      5     -2     23
    -1      3     -8     11
    -4     -2      6      6
```

```
rref(A)
```

```
ans = 3×4
    1.0000        0        0    -2.7073
         0   1.0000        0     5.5610
         0        0   1.0000     1.0488
```

```
% Symbolic substitution

clc, clear
syms x y

y = 3*x^2 + 6*x
```

$y = 3\,x^2 + 6\,x$

```
double(subs(y, x, 3))
```

```
ans = 45
```

```
clc, clear
syms x y z
y = 3*x + 3*z
```

$y = 3\,x + 3\,z$

```
double(subs(y,{x,z},{1,2}))
```

```
ans = 9
```

d/dx and integration

```
clc, clear
syms x y z
y = sin(3*x) - z*exp(x) + 4*x*z + z^2
```

$$y = \sin(3\,x) + 4\,x\,z - z\,\mathrm{e}^x + z^2$$

```
dydx = diff(y,x)
```

$$dydx = 4\,z + 3\cos(3\,x) - z\,\mathrm{e}^x$$

```
dydz = diff(y,z)
```

$$dydz = 4\,x + 2\,z - \mathrm{e}^x$$

```
double(subs(dydz, {x,z}, {2,3}))
```

ans = 6.6109

```
clc, clear
syms x y z
y = exp(x^2)
```

$$y = \mathrm{e}^{x^2}$$

```
int(y,x)
```

ans =

$$\frac{\sqrt{\pi}\,\mathrm{erfi}(x)}{2}$$

```
y2 = x^3
```

$$y2 = x^3$$

```
int(y2,x,0,1)
```

ans =

$$\frac{1}{4}$$