Just about any math equation !!!

For BASIC MATH: sympy library in Jupyter Notebook allows you to:

- Solve
- Simplify
- Expand
- Factor
- Collect
- Evaluate
- Create LaTeX

In [23]:
```
from sympy import *
init_printing()
```

In [48]:
```
x, y, z = symbols("x, y, z")
```

In [5]:
```
a, b,c,d = symbols ('a b c d')
```

In [10]:
```
#  Solve qiadratic gernerally -- LaTeX printing
solve ( a*x **2+ b*x+c , x)
```

Out[10]: $\left[\frac{1}{2a}\left(-b+\sqrt{-4ac+b^2}\right), \quad -\frac{1}{2a}\left(b+\sqrt{-4ac+b^2}\right)\right]$

In [12]:
```
#  Solve particular quadratic
integerRoots = solve(x**2 - 2*x +1)
integerRoots
```

Out[12]: $[1]$

In [15]:
```
#  Solve particular quadratic with REAL roots
realRoots = solve(x**2 - x -1)
realRoots
```

Out[15]: $\left[\frac{1}{2}+\frac{\sqrt{5}}{2}, \quad -\frac{\sqrt{5}}{2}+\frac{1}{2}\right]$

In [16]:
```
#  Solve particular quadratic with IMAGINARY roots
complexRoots = solve(x**2 - x +1)
complexRoots
```

Out[16]: $\left[\frac{1}{2}-\frac{\sqrt{3}i}{2}, \quad \frac{1}{2}+\frac{\sqrt{3}i}{2}\right]$

In [26]:
```
trig = (x + x**2)/(x*sin(y)**2 + x*cos(y)**2)
trig
```

Out[26]: $\frac{x^2+x}{x\sin^2(y)+x\cos^2(y)}$

In [25]:
```
simplifyAlgebra = simplify((x**2 + 2*x +1)/(x+1))
simplifyAlgebra
```

Out[25]: $x + 1$

In [27]:
```
trig = (x + x**2)/(x*sin(y)**2 + x*cos(y)**2)
trig
```

Out[27]: $\frac{x^2 + x}{x\sin^2(y) + x\cos^2(y)}$

In [28]:
```
trigSimp = simplify((x + x**2)/(x*sin(y)**2 + x*cos(y)**2))
trigSimp
```

Out[28]: $x + 1$

In [39]:
```
#  Expand algebra correctly -- Binomial Theorem
expandAlgebra = expand((x+1)**4)
expandAlgebra
```

Out[39]: $x^4 + 4x^3 + 6x^2 + 4x + 1$

In [38]:
```
factorAlgebra = factor(x**5 + 5*x**4+10*x**3+10*x**2+5*x+1)
factorAlgebra
```

Out[38]: $(x + 1)^5$

In [41]:
```
# What are the factors?
factor_listAlgebra = factor_list(x**2*z + 4*x*y*z + 4*y**2*z)
factor_listAlgebra
```

Out[41]: $(1, \quad [(z, \quad 1), \quad (x + 2y, \quad 2)])$

In [42]:
```
#  Collect many terms
checkAlgebra = x*y + x - 3 + 2*x**2 - z*x**2 + x**3
checkAlgebra
```

Out[42]: $x^3 - x^2z + 2x^2 + xy + x - 3$

In [52]:
```
collectAlgebra = collect(x*y + x - 3 + 2*x**2 - z*x**2 + x**3,x)
collectAlgebra
```

Out[52]: $x^3 + x^2(-z + 2) + x(y + 1) - 3$

Built In Documentation - LaTex Printing

$$F(k) = \int_{-\infty}^{\infty} f(x) e^{2\pi i k} dx$$

$$a = \tfrac{1}{2} \qquad b = \tfrac{3}{4} \quad (1)$$

$$c = \sqrt{a^2 + b^2}$$

In [21]:
```
%%latex
$c = \sqrt{a^2 + b^2}$
```

$c = \sqrt{a^2 + b^2}$

In [25]:
```
print(latex(Integral(cos(x)**2, (x, 0, pi))))
```

```
\int_{0}^{\pi} \cos^{2}{\left (x \right )}\, dx
```

In [27]:
```
integrate(cos(x)**2, x)
```

Out[27]: $\frac{x}{2} + \frac{1}{2}\sin(x)\cos(x)$

In [1]:
```
%%latex
$\int_{0}^{\pi} \cos^{2}{\left (x \right )}\, dx$
```

$\int_0 \cos^2(x)\, dx$

$\int_0^{\pi} \cos^2(x)\, dx$