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LeeSmithSBCC / Jupyter-Math-For-Nerds

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Jupyter-Math-For-Nerds / Jupiter-Files / MathWithSumpy\_ALGEBRA\_082918.ipynb

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LeeSmithSBCC Added Algebra

c16ff1c 12 minutes ago

1 contributor

590 lines (589 sloc) 29 KB

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## 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 quadratic generally -- LaTeX printing  
solve(a*x**2 + b*x + c, x)
```

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

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

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

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

```
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, [(z, 1), (x + 2y, 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

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

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

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

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

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

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

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

