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LeeSmithSBCC / Jupyter-Math-For-Nerds

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Jupyter-Math-For-Nerds / Jupiter-Files / MathWithSumpy_DERIVATIVES_082918.ipynb

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LeeSmithSBCC Added Derivatives

f1f7766 5 minutes ago

1 contributor

450 lines (449 sloc) 20.7 KB

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History



Just about any math equation !!!

- Derivative of one dimensional variable
- Derivative of multimensional variable

```
In [1]: from sympy import *  
init_printing()
```

```
In [2]: x, y, z = symbols("x, y, z")
```

```
In [52]: a, b,c,d = symbols ('a b c d')  
f,g = symbols('f g', cls=Function)
```

Simple One Dimensional variable

```
In [6]: diff(x**4, x)
```

```
Out[6]: 4x3
```

```
In [7]: diff(x**4, x,x)
```

```
Out[7]: 12x2
```

```
In [9]: diff(x**4, x,x,x)
```

```
Out[9]: 24x
```

```
In [10]: diff(x**4, x,x,x,x)
```

```
Out[10]: 24
```

```
In [15]: # When would this be useful?  
leeExpr.diff(x,y,z,1)
```

```
Out[15]: (x2y2z2 + 3xyz + 1)exyz
```

More Complex Derivatives

```
In [18]: leeExpr2 = x*(x+1)*(x+2)  
leeExpr2
```

```
Out[18]: x(x + 1)(x + 2)
```

```
In [25]: # First Derivative  
leeFirstDeriv = leeExpr2.diff(x)  
leeFirstDeriv
```

```
Out[25]: x(x + 1) + x(x + 2) + (x + 1)(x + 2)
```

```
In [27]: # Second Derivative
leeSecondDeriv = diff(leeFirstDeriv, n=2)
leeSecondDeriv
```

Out[27]:

```
In [31]: leeFunc_x_y = sin(y)*cos(x)**2
leeFunc_x_y
```

Out[31]:

```
In [33]: # Differentiate with respect to x
deriv_leeFunc_x_y = diff(leeFunc_x_y,x)
deriv_leeFunc_x_y
```

Out[33]: $-2\sin(x)\sin(y)\cos(x)$

```
In [34]: # Differentiate with respect to y
deriv_leeFunc_x_y = diff(leeFunc_x_y,y)
deriv_leeFunc_x_y
```

Out[34]: $\cos^2(x)\cos(y)$

```
In [43]: # Differentiate with respect to x THEN differentiate with respect to y
# THEN differentiate with respect to x again
deriv_leeFunc_x_y = diff(leeFunc_x_y,x,y,x)
deriv_leeFunc_x_y
```

Out[43]: $2(\sin^2(x) - \cos^2(x))\cos(y)$

```
In [47]: # Chain rule
f = x**2
g = sin(x)
chainDiff = diff((f*g, x))
chainDiff
```

Out[47]: $\frac{d}{dx}(x^2\sin(x), \quad x)$

