# Sympy

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You may want to familiarize yourself with symbolic algebra packages, such as the **Sympy** package which runs in python. The following session allowed me to simplify two complex expressions and prove they were identical.

I had derived this expression:

$$\frac{k\,(k+1)\,(2k+1)}{6} + (k+1)^2$$

And another expression I derived:

$$\frac{1\,(k+1)\,(k+2)\,(2k+3)}{6}$$

And I wanted to show that these were equal.

Sympy to the rescue! Sympy even formatted them in LaTeX for me:

```
>>> import sympy
>>> k = sympy.symbols('k')
>>> exp1 = k*(k+1)*(2*k+1)/6 + (k+1)**2
>>> print(sympy.latex(exp1))
\frac{k}{6} \left(k + 1\right) \left(2 k + 1\right) + \left(k + 1\right)^{2}
>>> exp2 = (k+1)*((k+1)+1)*(2*(k+1)+1)/6
>>> print(sympy.latex(exp2))
\frac{1}{6} \left(k + 1\right) \left(k + 2\right) \left(2 k + 3\right)
>>> sympy.expand(exp1)
k**3/3 + 3*k**2/2 + 13*k/6 + 1
>>> print(sympy.latex(sympy.expand(exp1)))
\frac{k^{3}}{3} + \frac{3 k^{2}}{2} + \frac{13 k}{6} + 1
>>> sympy.expand(exp2)
k**3/3 + 3*k**2/2 + 13*k/6 + 1
>>> print(sympy.latex(sympy.expand(exp2)))
\frac{k^{3}}{3} + \frac{3 k^{2}}{2} + \frac{13 k}{6} + 1
>>>
```

Thus I knew that both expressions were equal to

$$\frac{k^3}{3} + \frac{3k^2}{2} + \frac{13k}{6} + 1$$