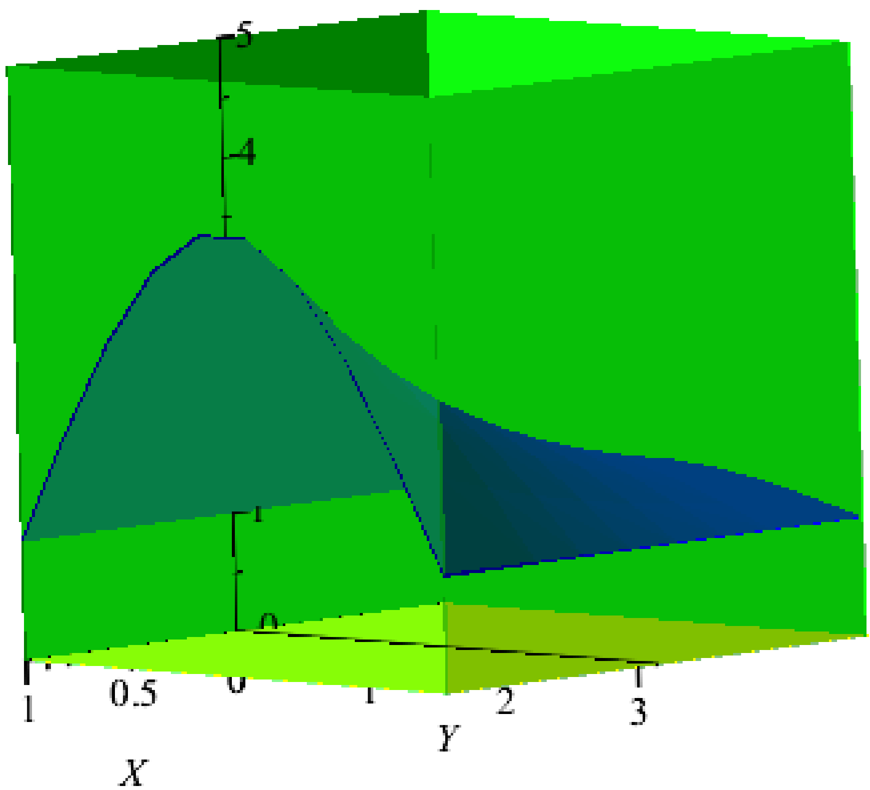
> $with(plots):$

> **#1**

> $implicitplot3d([z = 1 + e^x \cdot \sin(y), x = -1, x = 1, y = 0, y = \mathrm{Pi}, z = 0], x = -1.01..1.01, y = -0.01..\mathrm{Pi} + 0.01, z = -0.01..5, axes = normal, color = [blue, green, green, green, green, yellow], labels = [X, Y, Z])$

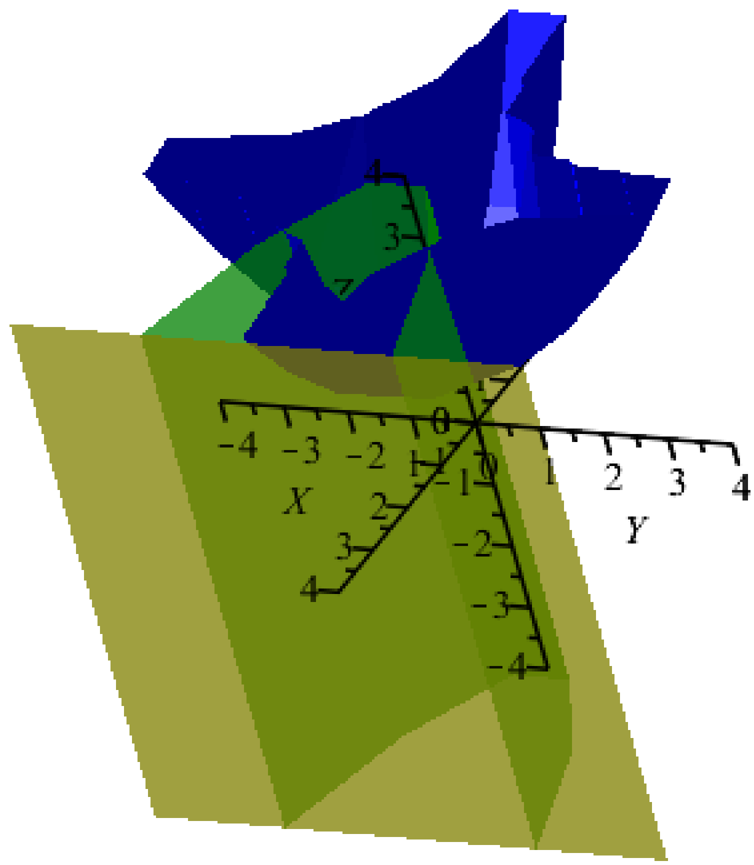


> $\int_{-1}^{1}\int_{0}^{\mathrm{Pi}} 1 + e^x \cdot \sin(y)\, dy\, dx$

$$2\pi - 2e^{-1} + 2e \qquad (1)$$

> **#2**

> $implicitplot3d([z = 1 + x^2 \cdot y^2, x = y^2, x = 4], x = -4..4.01, y = -4..4, z = -4..4, axes = normal, color = [blue, green, yellow], labels = [X, Y, Z])$



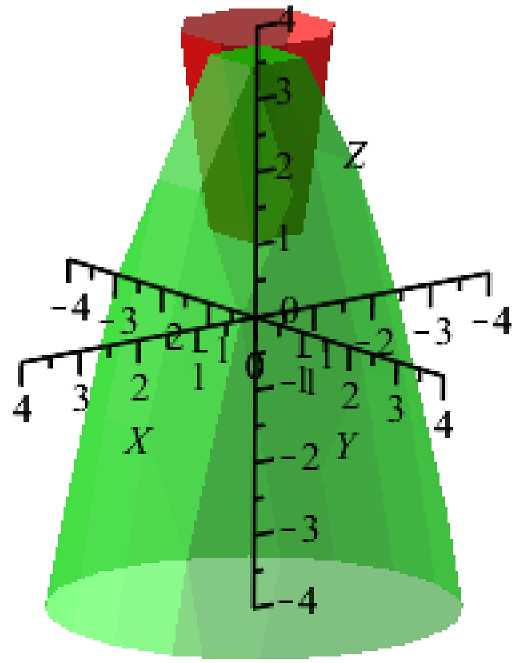
> $2 \cdot \int_0^4 \int_0^{\sqrt{x}} 1 + x^2 \cdot y^2 \, dy \, dx$

$$\frac{2336}{27} \tag{2}$$

> **Because $x = y^2$ results in a parabola where 2 values of y can result in x = 4, when solving for y with respect to x, I first considered the top half of $+-\sqrt{x}$ in the integration. With these bounds also containing 0 through 4, the result would be half the volume contained in the enclosed region. This is why I multiply the integral by 2 in the beginning.**

> **#3**

> $implicitplot3d\left(\left[z = 3 \cdot x^2 + 3 \cdot y^2, z = 4 - x^2 - y^2\right], x = -4..4, y = -4..4, z = -4..4, axes = normal, color = [red, green], axes = normal, labels = [X, Y, Z]\right)$



> $$\int_0^{2\cdot \mathrm{Pi}}\int_0^1 r\cdot\left(4-r^2-3\cdot r^2\right)\,\mathrm{d}r\,\mathrm{d}\theta$$

$$2\pi \tag{3}$$

> $$\int_{-2}^{2}\int_{y^2}^{4} 1+x^2\cdot y^2\,\mathrm{d}x\,\mathrm{d}y$$

$$\frac{2336}{27} \tag{4}$$

> **This last line is to confirm that #2 is correct. The penultimate line is the answer to #3, which is 2π.**