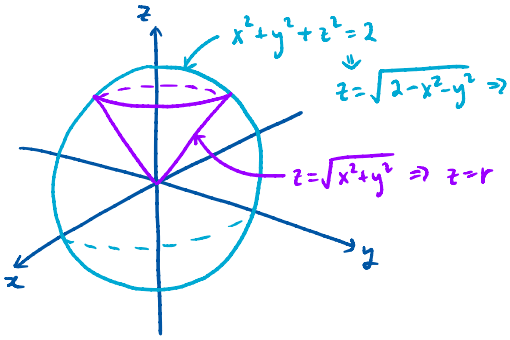
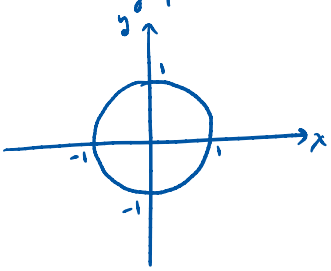
$\rightarrow \iiint_E 1 \, dV$

**Example 4.** Set up an iterated integral to find the volume of the solid that is enclosed by the cone $z = \sqrt{x^2 + y^2}$ and the sphere $x^2 + y^2 + z^2 = 2$. Use cylindrical coordinates.




Projection onto xy-plane:




$\sqrt{2-x^2-y^2} = \sqrt{x^2+y^2}$

$\Rightarrow 2-x^2-y^2 = x^2+y^2$

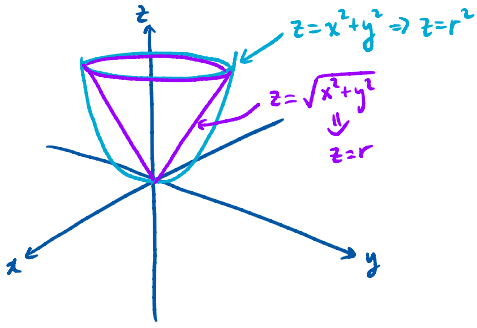
$\Rightarrow 2(x^2+y^2) = 2$

$\Rightarrow x^2+y^2 = 1$

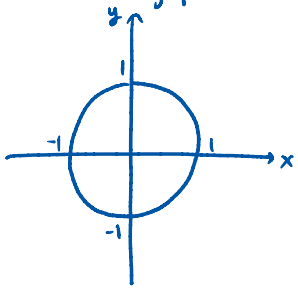
$$\iiint_E 1 \, dV = \int_0^{2\pi} \int_0^1 \int_r^{\sqrt{2-r^2}} r \, dz \, dr \, d\theta$$

## 3 If we have time...

**Example 5.** Set up an iterated integral to find the volume of the solid above the paraboloid $z = x^2 + y^2$ and below the half-cone $z = \sqrt{x^2 + y^2}$. Use cylindrical coordinates.




Projection onto xy-plane:




$x^2+y^2 = \sqrt{x^2+y^2}$

$\Rightarrow (x^2+y^2)^2 = (x^2+y^2)$

$\Rightarrow (x^2+y^2)\left[x^2+y^2-1\right] = 0$

$\Rightarrow x^2+y^2 = 0$

or $x^2+y^2 = 1$

$$\iiint_E 1 \, dV = \int_0^{2\pi} \int_0^1 \int_r^{r^2} r \, dz \, dr \, d\theta$$