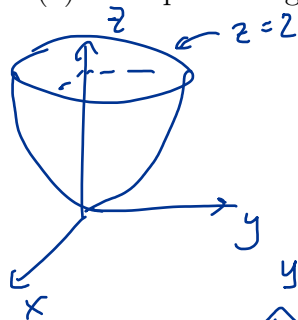# Quiz 2

Name: _____

Student ID Number: _____

Let E be the solid bounded by the paraboloid $z = x^2 + y^2$ and the plane $z = 2$, and $f(x, y, z)$ be a continuous function on it.
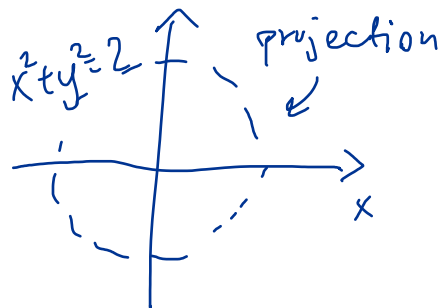
(a) Set up an integral $\iiint_E f(x, y, z)dV$ **in the order** $dzdxdy$.

On E: $x^2 + y^2 \leq z \leq 2$

Find projection:

$$\begin{cases} z = x^2 + y^2 \\ z = 2 \end{cases} \Rightarrow x^2 + y^2 = 2$$

projection

$$\iiint_E f(x, y, z) \, dV = \int_{-\sqrt{2}}^{\sqrt{2}} \int_{-\sqrt{2-y^2}}^{\sqrt{2-y^2}} \int_{x^2+y^2}^{2} f(x, y, z) \, dz \, dx \, dy$$

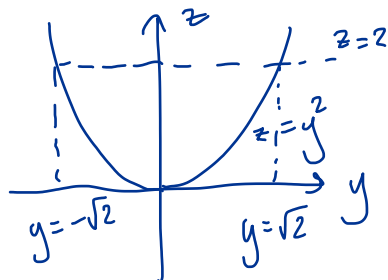(b) Set up an integral $\iiint_E f(x, y, z)dV$ **in the order** $dxdzdy$.

Solve for x in the boundary equations.

① $x = \sqrt{z - y^2}$

② $x = -\sqrt{z - y^2}$ $\Rightarrow$ $-\sqrt{z - y^2} \leq x \leq \sqrt{z - y^2}$

③ $z = 2$

Projection on yz plane: $\sqrt{z - y^2} = -\sqrt{z - y^2}$ (intersect ① & ②)

$\Rightarrow z = y^2$

$$\iiint_E f \, dV = \int_{-\sqrt{2}}^{\sqrt{2}} \int_{y^2}^{2} \int_{-\sqrt{z-y^2}}^{\sqrt{z-y^2}} f(x, y, z) \, dx \, dz \, dy$$