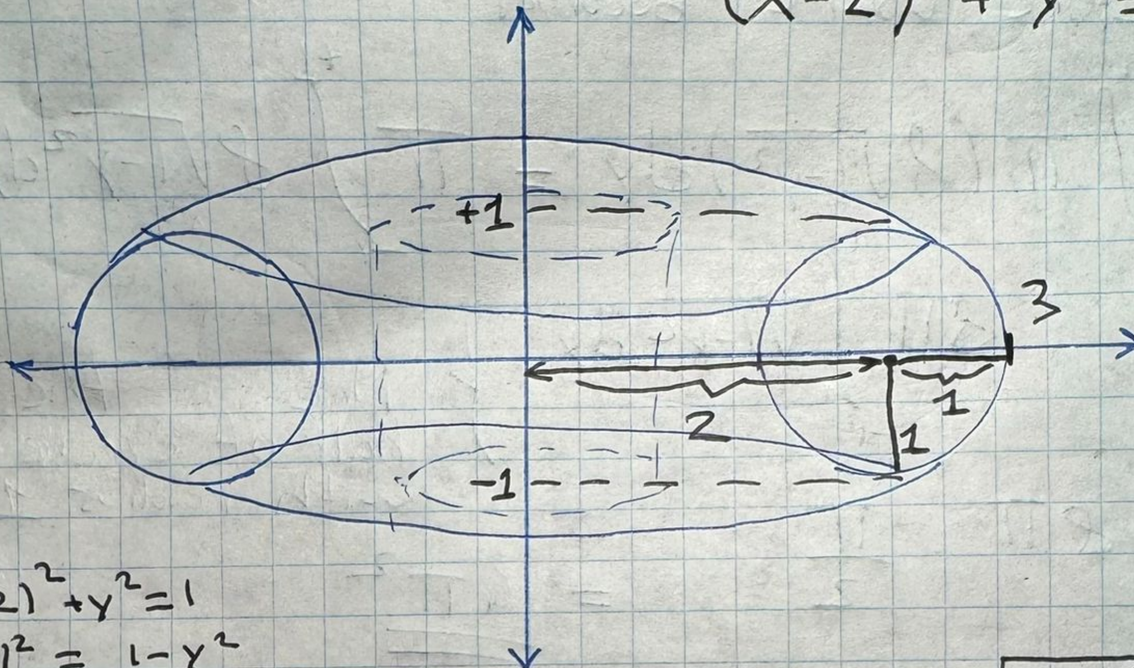
Washer Method:

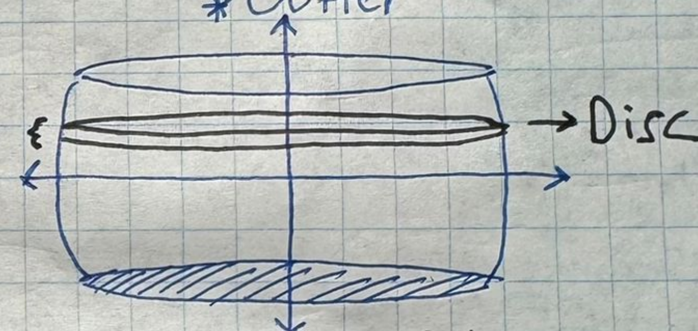
$$(x-2)^2+y^2=1$$



$$\left[\begin{aligned}(x-2)^2+y^2&=1\\(x-2)^2&=1-y^2\\x-2&=\sqrt{1-y^2}\\x&=2\pm\sqrt{1-y^2}\end{aligned}\right]$$

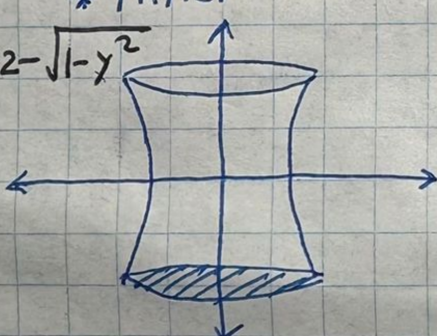
$*$ $x=2+\sqrt{1-y^2}$

$*$ Outter



$*$ Inner

$*\ x=2-\sqrt{1-y^2}$



$V_{disc}=\pi r^2 \cdot \text{thickness}$

$*\ V_{disc}=\pi\left(2+\sqrt{1-y^2}\right)^2dy$

$$+\underbrace{\int_{-1}^{+1}\pi\left(2+\sqrt{1-y^2}\right)^2dy}_{\text{Outter}}-\underbrace{\int_{-1}^{+1}\pi\left(2-\sqrt{1-y^2}\right)^2dy}_{\text{Inner}}$$

$*\ \left(2+\sqrt{1-y^2}\right)^2=4+4\sqrt{1-y^2}+(1-y^2)$ $\quad *\ \left(2-\sqrt{1-y^2}\right)^2=4-4\sqrt{1-y^2}+(1-y^2)$

$\Rightarrow 5+4\sqrt{1-y^2}-y^2$ $\quad\quad \Rightarrow 5-4\sqrt{1-y^2}-y^2$

$$\left(\cancel{5}+4\sqrt{1-y^2}\cancel{-y^2}\right)-\left(\cancel{5}+4\sqrt{1-y^2}\cancel{-y^2}\right)$$

$$=8\sqrt{1-y^2}$$

therefore volume becomes

$$\int_{-1}^{1} \pi \left(8\sqrt{1-y^2}\right) dy = \pi \int_{-1}^{+1} 8\sqrt{1-y^2}\, dy$$

$$\Rightarrow \quad 8\pi \underbrace{\int_{-1}^{1} \sqrt{1-y^2}\, dy}_{\text{Area of the half of a circle with radius 1}}$$

$$8\pi \cdot \frac{\pi}{2} = \underline{\underline{4\pi^2}}$$