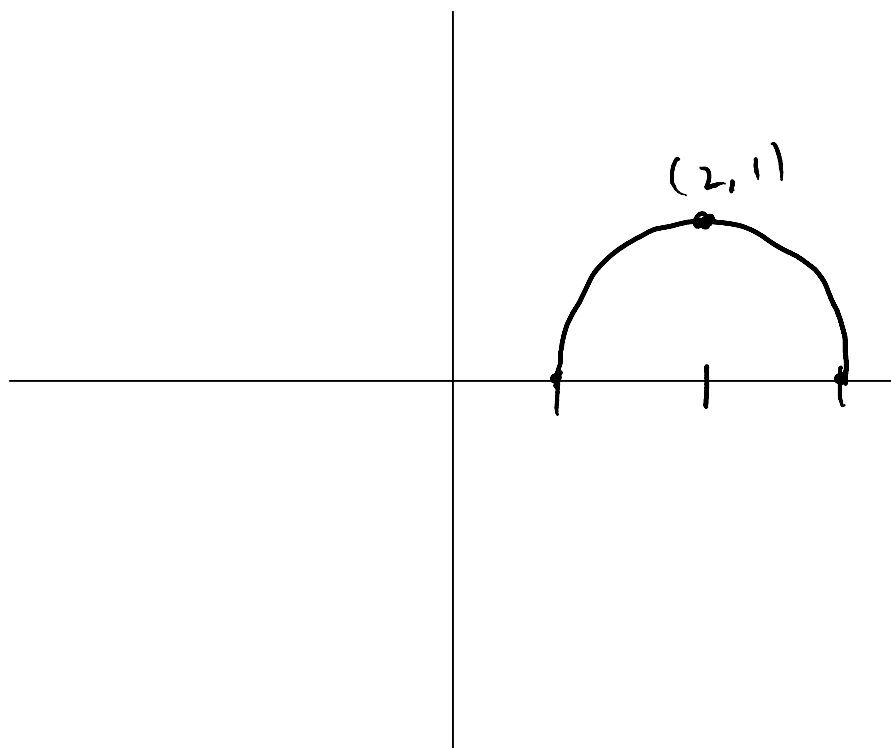


Sec 6.3 Cylindrical Shells (Another volume Method)

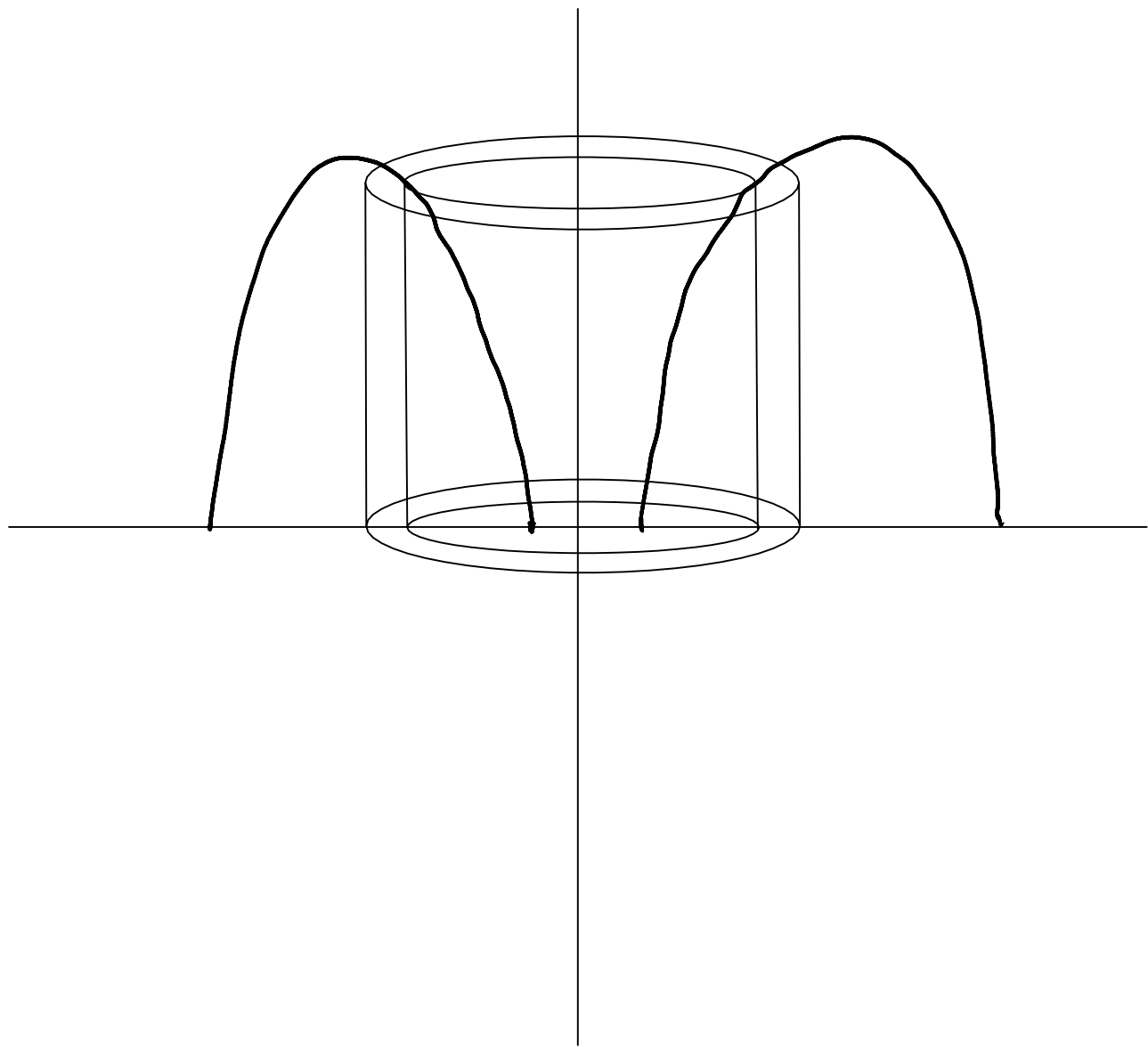
Some volume problems have wacky shapes and one way to deal with them is using cylindrical shells.

Ex. Consider the solid formed by rotating the region bounded by the curves $y = -(x - 2)^2 + 1$ and $y=0$

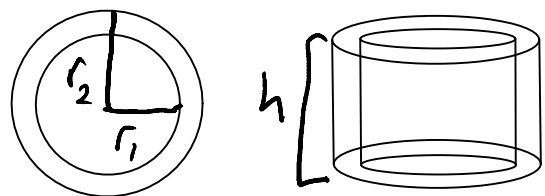


Since It would be difficult to set up an inner and outer radius for the washer method we will use a different shape. A cylindrical Shell.

<https://www.youtube.com/watch?v=DaUYqq2uUxE&feature=youtu.be>



Sec 6.3 Cylindrical Shells (Another volume Method)

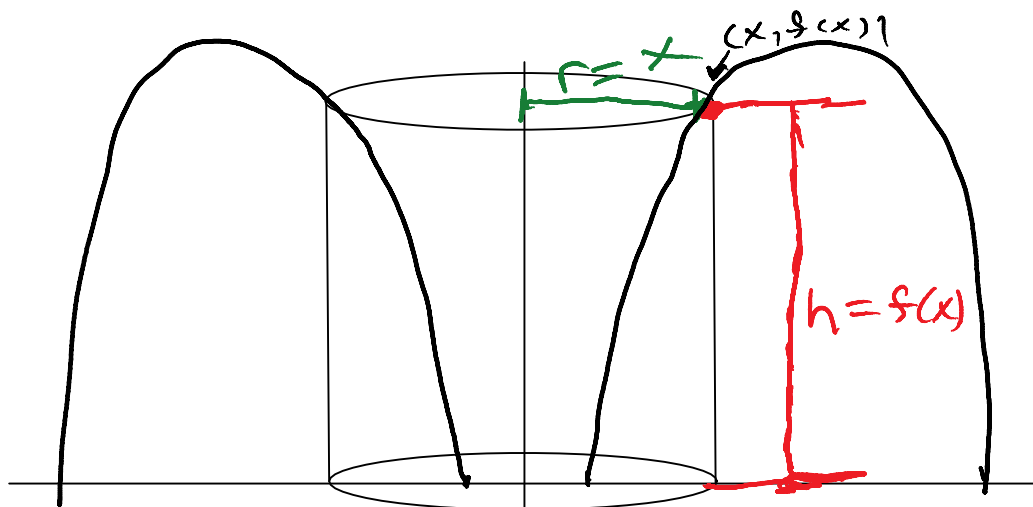


$$\begin{aligned}
 V &= \pi r_2^2 h - \pi r_1^2 h \\
 &= \pi (r_2 + r_1)(r_2 - r_1) h \\
 &= 2\pi \left(\frac{r_2 + r_1}{2}\right) (r_2 - r_1) h \\
 &= 2\pi r_{\text{avg}} h \Delta r
 \end{aligned}$$

$$V \approx \sum_{i=1}^N 2\pi r_{\text{avg},i} h_i \Delta r$$

Let $\Delta r \rightarrow 0$
 $\Rightarrow r_{\text{avg}} = r$

$$\Rightarrow \int_a^b 2\pi r h dr$$



$$SA = 2\pi r h$$

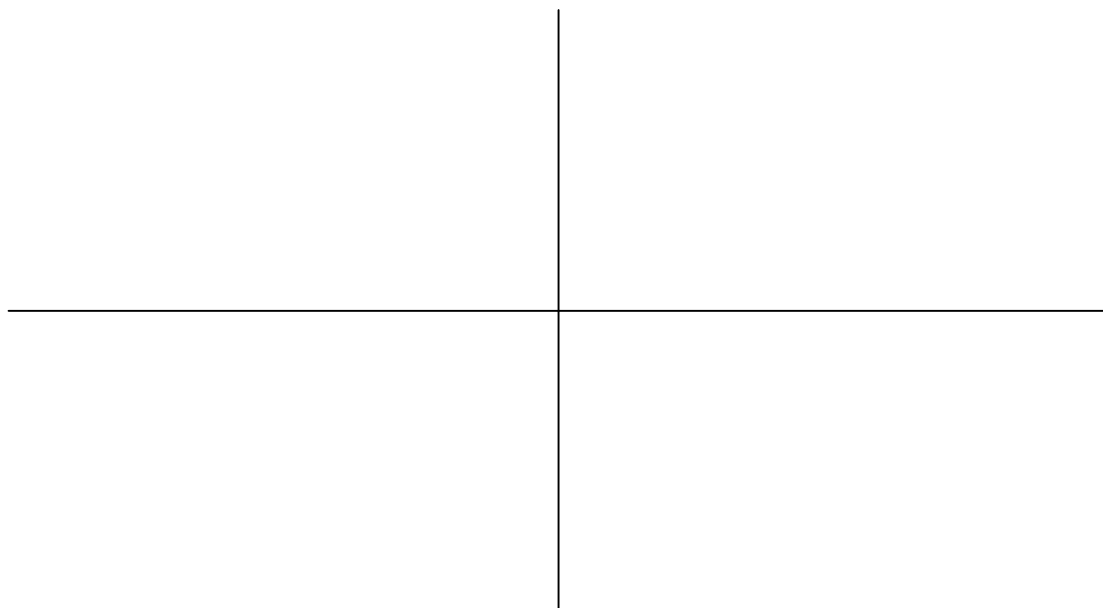
$$= 2\pi x f(x)$$

so we integrate

$$V = \int_a^b 2\pi x f(x) dx$$

Sec 6.3 Cylindrical Shells (Another volume Method)

Ex. Calculate the volume of the solid formed by rotating the region bounded by the curves $y = -(x - 2)^2 + 1$ and $y=0$



Sec 6.3 Cylindrical Shells (Another volume Method)

HW Example #5: Using the method of cylindrical shells find the volume of the solid formed by rotating the region bounded by the curves $y = e^{x^2}$, $y = 0$, $x = 0$ and $x = 1$ about the y-axis

