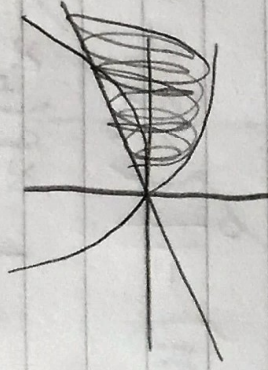


5.2 Finding Volume under Curve 5.3

revolve something around x-axis Formula: Washer Method

$$V = \pi \int_a^b (\text{outer radius})^2 - (\text{inner radius})^2 dx$$

Revolve around y-axis Formula: Shell method



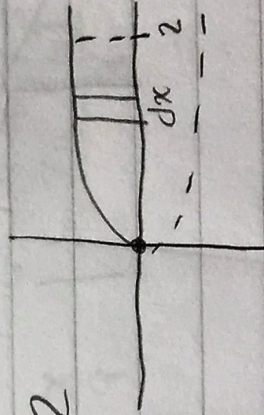
$$y = x^2 \quad y = x$$

$$x=0 \quad x=1$$

$$\int_0^1 [(x^2)^2 - (x^2)^2] dx$$

Washer

$$= \int_0^1 x^4 - x^4 dx = \frac{x^5}{5} - \frac{x^5}{5} \Big|_0^1 = \frac{1}{5} - \frac{1}{5} = 0$$



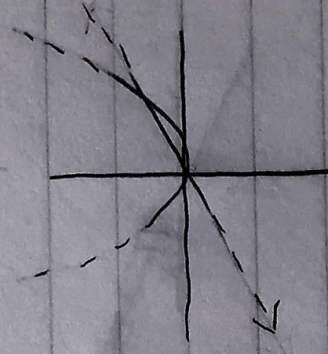
$$y = \sqrt{x} \quad x=0 \quad x=2$$

Washer

$$\int_0^2 [(\sqrt{x})^2 - (0)^2] dx$$

* Always 2 graphs, x axis = 0

$$\int_0^2 (x-0) dx = \pi \left(\frac{x^2}{2} \right) \Big|_0^2 = 2\pi \frac{4}{2} = 4\pi$$



$$y = x^2 \quad y = x$$

x axis

Washer

$$\pi \int_0^1 [(x^2)^2 - (x^2)^2] dx$$

and limits:

$$x^2 = x$$

$$x^2 - x = 0$$

$$(x-1) = 0$$

$$x=0 \quad x=1$$

$$\pi \left(\frac{x^3}{3} - \frac{x^5}{5} \right) \Big|_0^1$$

$$\pi \left(\frac{1^3}{3} - \frac{1^5}{5} \right) = \frac{1}{3} - \frac{1}{5} = \frac{2}{15}$$