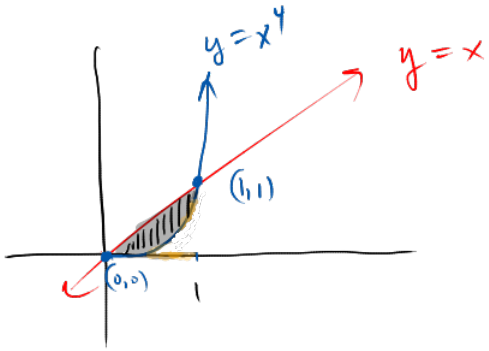
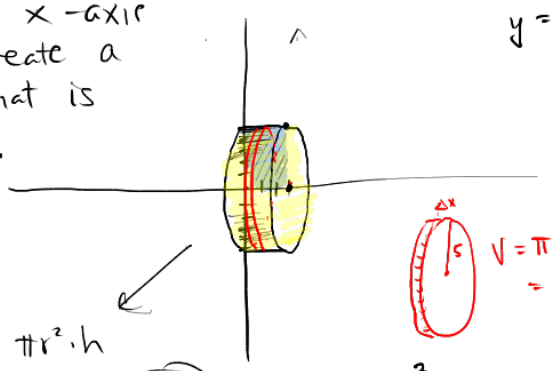


Find the area

$$\int_0^1 \underbrace{x}_{\text{top}} - \underbrace{x^4}_{\text{bottom}}\, dx$$

$$\frac{x^2}{2} - \frac{x^5}{5}\Big|_0^1 = \frac{1}{2} - \frac{1}{5} = \frac{5}{10} - \frac{2}{10} = \frac{3}{10}$$

Revolve the shaded area around x-axis $360^\circ = 2\pi$. Create a solid. What is the volume.



$V = \pi 5^2 \Delta x$

$= 25\pi \Delta x$

$\pi r^2 \cdot h$

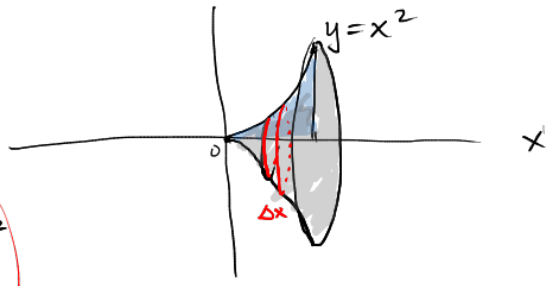
$\pi 5^2 \cdot 3 = 75\pi$

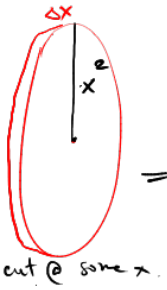
$$\int_0^3 25\pi \, dx = 25\pi \int_0^3 1 \cdot dx = 25\pi x \Big|_0^3$$

$$= 25\pi \cdot 3 - 25\pi \cdot 0$$

$$= 75\pi$$

revolve shaded region about x-axis.



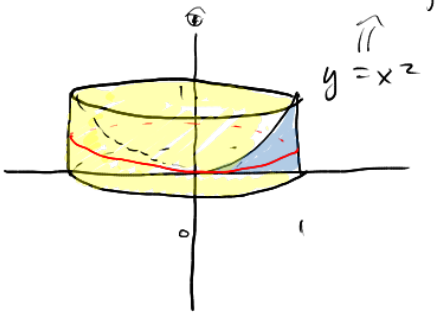


$\Rightarrow$ Volume $= \pi(x^2)^2 \cdot \Delta x$

(x^2: radius)

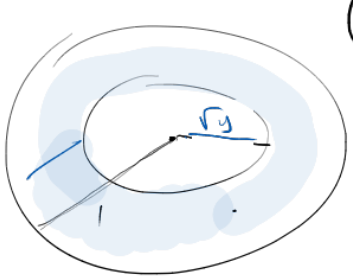
$$\text{Top Vol} = \int_0^1 \pi x^4 dx = \frac{\pi x^5}{5}\Big|_0^1 = \frac{\pi 1^5}{5} - \frac{\pi 0^5}{5}$$

$$= \boxed{\frac{\pi}{5}}$$



$\int_0^1 x^2 = \frac{x^3}{3}$

$\frac{1}{3}$



Integrate along y-axis.

$A = \pi(1)^2 - \pi(\sqrt{y})^2$

$= \pi - \pi y$

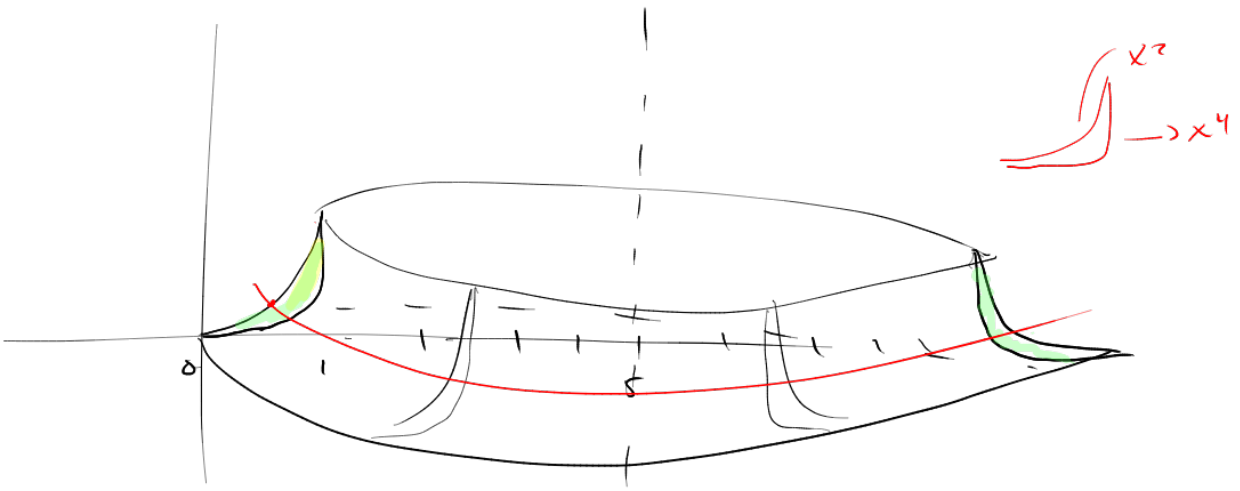
$= \pi(1-y)$

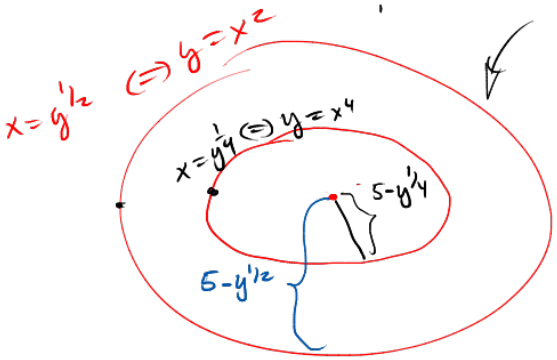
Dog Bowl Vol $\Rightarrow \int_0^1 \pi(1-y)\,dy$

$= \pi \int_0^1 1-y\,dy = \pi y - \frac{y^2}{2}\Big|_0^1$

$= \pi - \frac{1}{2} - \left(\pi 0 - \frac{0^2}{2}\right) = \pi - \frac{1}{2}$

Let's make an
open banana hat!





Area: $\pi(5-y^{1/2})^2 - \pi(5-y^{1/4})^2$

$$\int_0^1 \pi(5-y^{1/2})^2 - \pi(5-y^{1/4})^2 \, dy$$

$0 = 3.66$ cubic units