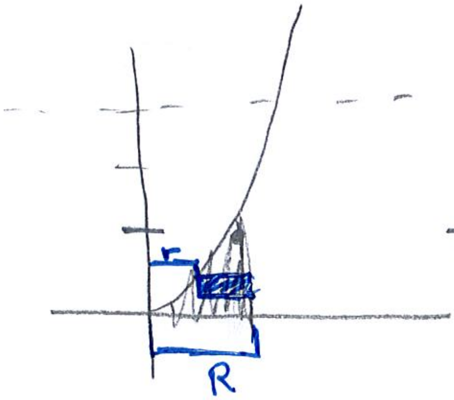
$y = x^3$ bounded by $x = 1$, $y = 0$, $x = 0$



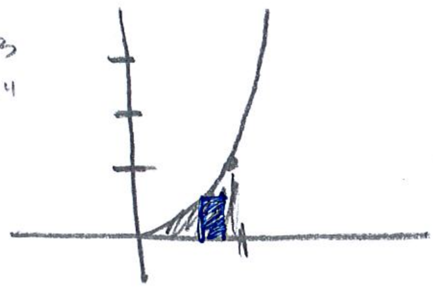
over y-axis

$$\pi \int_0^1 (1-0)^2 - (\sqrt[3]{y} - 0)^2 \, dy$$

$1 - y^{2/3}$

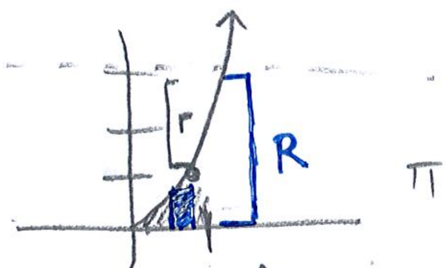
$$\pi \left[y - \tfrac{3}{5} y^{5/3} \right]_0^1 \qquad \frac{2}{5} \cdot \pi = \frac{2\pi}{5}$$

$y = 3$
$x = 4$



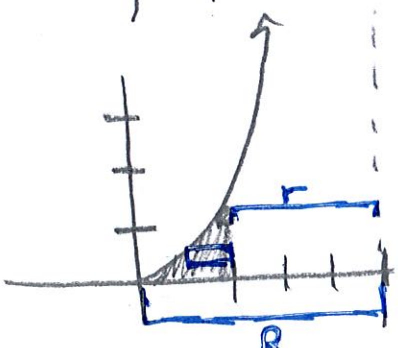
over x-axis

$$\pi \int_0^1 (x^3)^2 \, dx$$



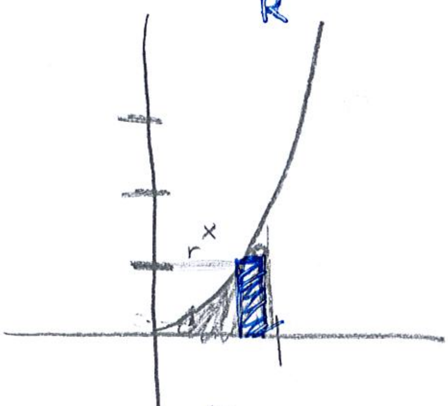
over $y = 3$

$$\pi \int_0^1 (3-0)^2 - (3 - x^3)^2 \, dx$$



over $x = 4$

$$\pi \int_0^1 (4 - \sqrt[3]{y})^2 - (4-1)^2 \, dy.$$

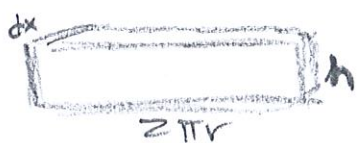


over y-axis.

r · h · thickness

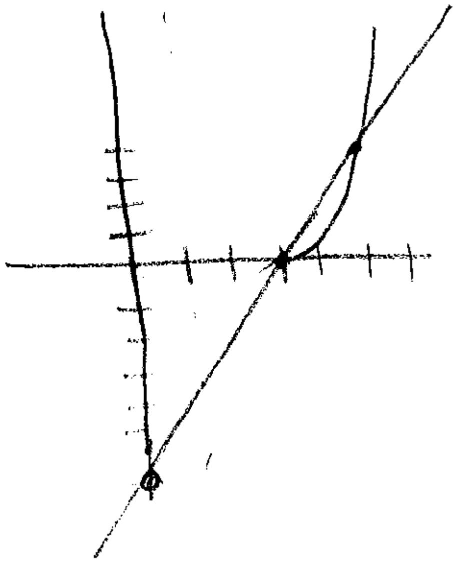
$$2\pi \int_0^1 x (x^3) \, dx \qquad \tfrac{1}{5} x^5$$

$$\frac{2\pi}{5}$$



Ex: $x = \sqrt{y} + 3$

$x = y/2 + 3$ rotated over the line $x = 1$

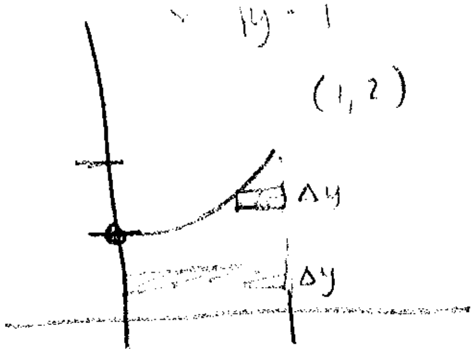


$$\pi \int_0^4 \left((\sqrt{y} + 3 - 1)^2 - \left(\frac{y}{2} + 3 - 1 \right)^2 \right) dy$$

$$\pi \int_0^4 \left((\sqrt{y} + 2)^2 - \left(\frac{y}{2} + 2 \right)^2 \right) dy$$

$$= 8\pi$$

Ex: $y = x^2 + 1$, $y = 0$, $x = 0$, and $x = 1$



$$r(y) = \begin{cases} 0 & 0 < y < 1 \\ \sqrt{y-1} & 1 < y < 2 \end{cases}$$

$$V = \pi \int_0^1 (1^2 - 0^2)\, dy + \pi \int_1^2 \left(1^2 - (\sqrt{y-1})^2 \right) dy$$

$$\pi \int_0^1 1\, dy + \pi \int_1^2 (2 - y)\, dy$$

$$\pi \left[y \right]_0^1 + \pi \left[2y - \tfrac{1}{2} y^2 \right]_1^2$$

$$\pi + \pi (4 - 2 - 2 - 1/2)$$

$$3\pi/2$$