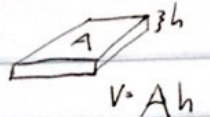


Some familiar volumes...



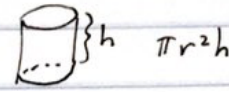
$$\frac{4}{3}\pi r^3$$



$$V = Ah$$

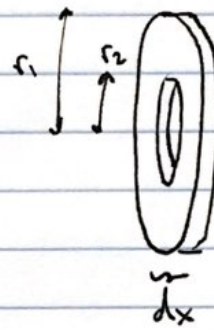
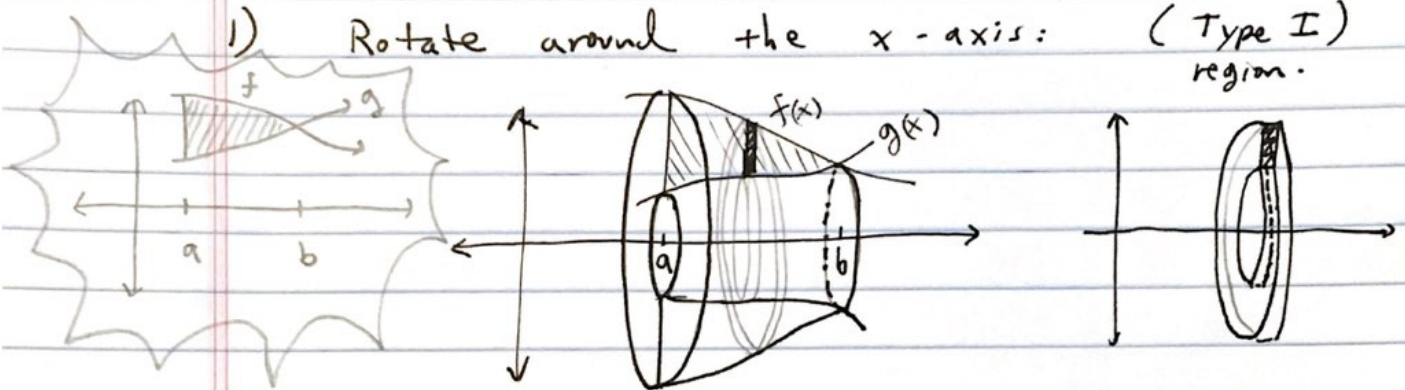
6.2

Volumes of rotation.



$$\pi r^2 h$$

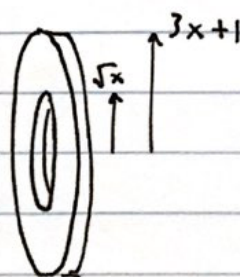
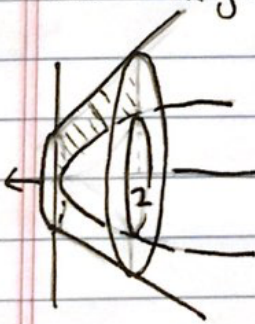
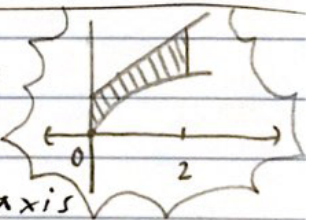
1) Rotate around the x -axis: (Type I region.)



$$\begin{aligned} dV &= \text{Area} \cdot dx \\ &= (\pi r_1^2 - \pi r_2^2) dx \\ &= \pi (f(x)^2 - g(x)^2) dx \end{aligned}$$

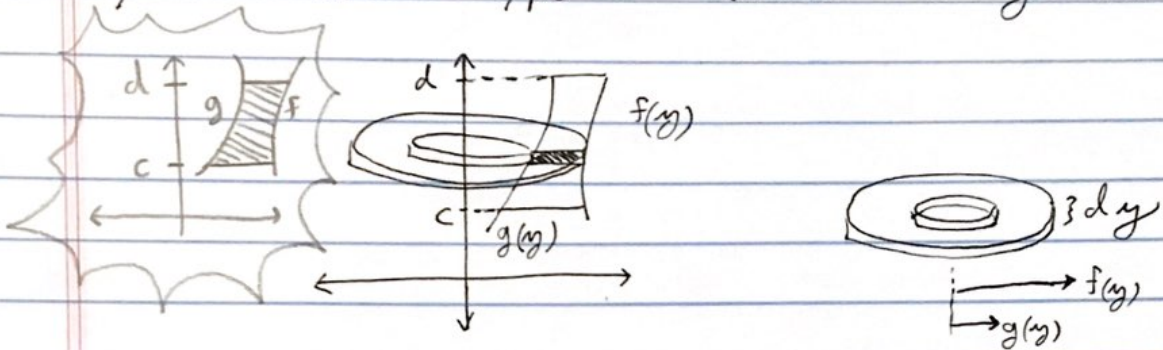
$$V = \int_a^b \pi (f(x)^2 - g(x)^2) dx$$

Ex: Region between $\begin{cases} x=0, & f(x) = y = 3x+1 \\ x=2, & g(x) = y = \sqrt{x} \end{cases}$
 \rightarrow rotated around x -axis

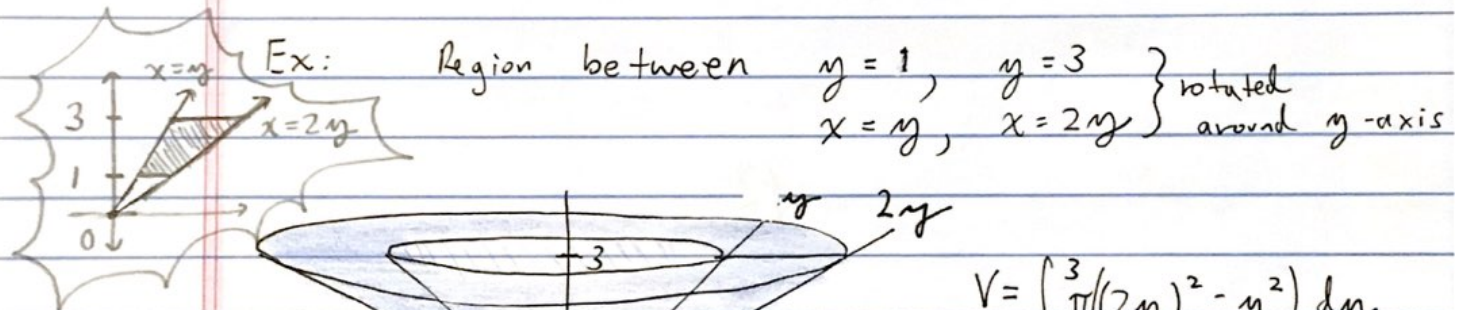


$$\begin{aligned} V &= \int_0^2 \pi ((3x+1)^2 - (\sqrt{x})^2) dx \\ &= \pi \int_0^2 (9x^2 + 6x + 1 - x) dx \\ &= 36\pi \text{ in}^3 \end{aligned}$$

2) Rotate Type II around the y -axis



$$V = \int_c^d \pi (f(y)^2 - g(y)^2) dy$$



$$V = \int_1^3 \pi ((2y)^2 - y^2) dy$$

$$= \pi \int_1^3 (4y^2 - y^2) dy$$

$$= \pi \int_1^3 3y^2 dy$$

$$= \pi [y^3]_1^3$$

$$= \pi (27 - 1)$$

$$= 26\pi$$