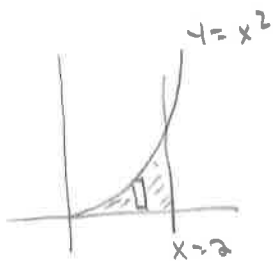


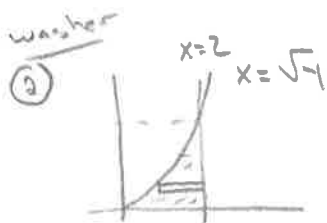
Calc BC 7-3 Volumes using disk/washer ws

① ^{Disk} $y = x^2$, $x = 2$, $y = 0$



$$V = \pi \int_0^2 (x^2)^2 dx$$

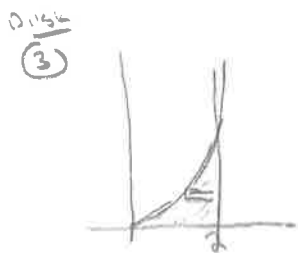
$$= \pi \left[\frac{1}{5} x^5 \right]_0^2 = \frac{32\pi}{5}$$



$$V = \pi \int_0^4 \left[2^2 - (\sqrt{y})^2 \right] dy$$

$$= \pi \left[4y - \frac{1}{2} y^2 \right]_0^4$$

$$= \pi(16 - 8) = 8\pi$$

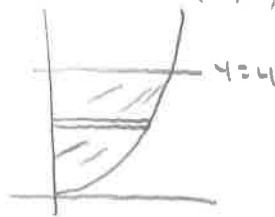


$$V = \pi \int_0^4 (2 - \sqrt{y})^2 dy$$

$$= \pi \int_0^4 (4 - 4\sqrt{y} + y) dy$$

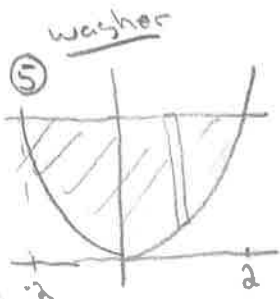
$$= \pi \left[\frac{1}{2} y^2 - \frac{8}{3} y^{\frac{3}{2}} + 4y \right]_0^4 = \pi \left(8 - \frac{64}{3} + 16 \right) = \frac{8\pi}{3}$$

④ ^{Disk} $y = x^2$, $x = \sqrt{y}$



$$V = \pi \int_0^4 (\sqrt{y})^2 dy$$

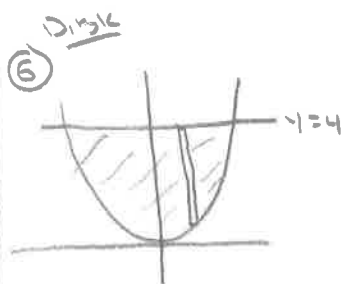
$$= \pi \left[\frac{1}{2} y^2 \right]_0^4 = 8\pi$$



$$V = 2\pi \int_0^2 (4^2 - (x^2)^2) dx$$

$$= 2\pi \left[16x - \frac{1}{5} x^5 \right]_0^2$$

$$= 2\pi \left(32 - \frac{32}{5} \right) = \frac{256\pi}{5}$$



$$V = 2\pi \int_0^4 (4 - x^2)^2 dx$$

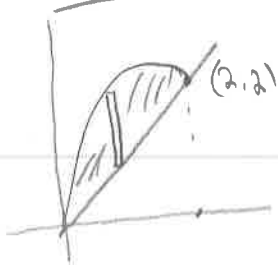
$$= 2\pi \int_0^4 (x^4 - 8x^2 + 16) dx$$

$$= 2\pi \left[\frac{1}{5} x^5 - \frac{8}{3} x^3 + 16x \right]_0^4$$

$$= 2\pi \left(\frac{32}{5} - \frac{64}{3} + 32 \right)$$

$$= \frac{512\pi}{15} \approx 107.233$$

⑦ washer



$$V = \pi \int_0^2 [(3x - x^2)^2 - x^2] dx$$

$$= \pi \int_0^2 (x^4 - 6x^3 + 9x^2 - x^2) dx$$

$$= \pi \int_0^2 (x^4 - 6x^3 + 8x^2) dx$$

$$= 11.729$$

⑧ Disk

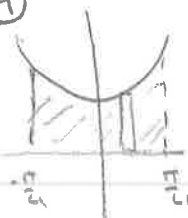


$$V = \pi \int_0^{\pi} \sin^2 x dx$$

$$= \pi \left[\frac{x}{2} - \frac{\sin x \cdot \cos x}{2} \right]_0^{\pi}$$

$$= \frac{\pi^2}{2}$$

⑨



Disk

$$V = 2\pi \int_0^{\pi/4} \sec^2 x dx$$

$$= 2\pi [\tan x]_0^{\pi/4} = 2\pi$$

⑩



washer

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

$$= \pi \int_0^2 (4x^2 - x^4) dx$$

$$= \pi \left[\frac{4}{3} x^3 - \frac{1}{5} x^5 \right]_0^2$$

$$= \pi \left(\frac{32}{3} - \frac{32}{5} \right) = \frac{64\pi}{15}$$