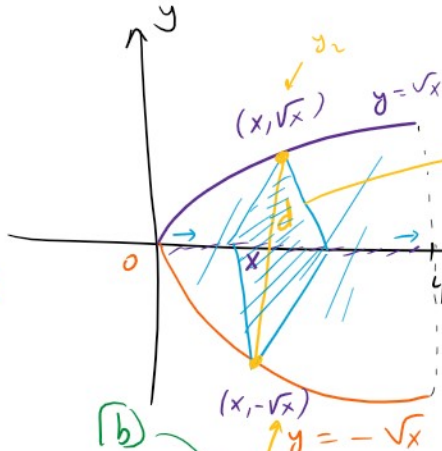


Q1, Q47

Q1

CS: cross section
A(x): Area of CS

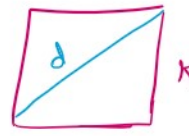


CS $\perp$ x-axis $\Rightarrow V = \int_a^b A(x) dx$

$= \int_0^4 2x dx$

$A(x) = (K)(K) = K^2 = \left(\frac{d}{2}\right)^2 = \frac{(2\sqrt{x})^2}{2} = \frac{4x}{2} = 2x$

$V = x^2 \Big|_0^4 = 16$



$d^2 = K^2 + K^2 = 2K^2 \Rightarrow K^2 = \frac{d^2}{2}$

CS $\perp$ x-axis $\Rightarrow V = \int_a^b A(x) dx$

CS $\perp$ y-axis $\Rightarrow V = \int_c^d A(y) dy$

Q47

if CS is Disk $\perp$ x-axis $\Rightarrow A(x) = \pi R^2(x)$

CS $\perp$ y-axis $\Rightarrow A(y) = \pi R^2(y)$

diameter = $2r$



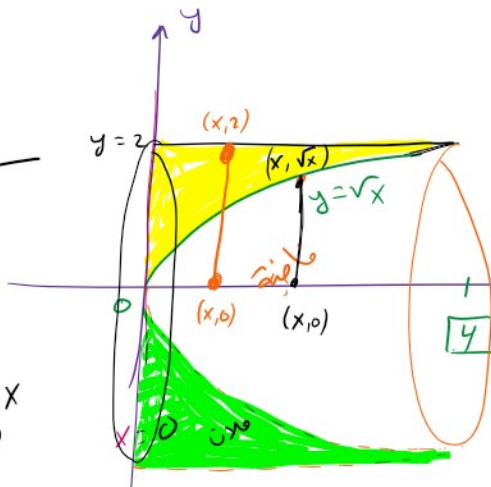
Q47

Washer Method WM
Disk Method DM
Shell = SM

(a)



$V = \pi \int_a^b [R^2(x) - r^2(x)] dx$



$y=2$
 $\sqrt{x}=2$
 $x=4$

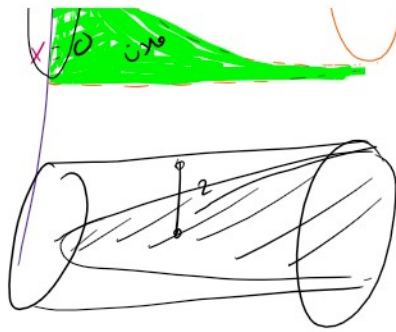
$R(x) = y_2 - y_1 = 2 - 0 = 2$

$$V = \pi \int_a^b |R(x) - r(x)|^2 dx$$

(a) ↗ المشقة

$$= \pi \int_0^4 [2^2 - (\sqrt{x})^2] dx$$

$$= \pi \int_0^4 (4 - x) dx = \dots = \underline{\underline{8\pi}}$$



$$R(x) = y_2 - y_1 = 2 - 0 = 2$$

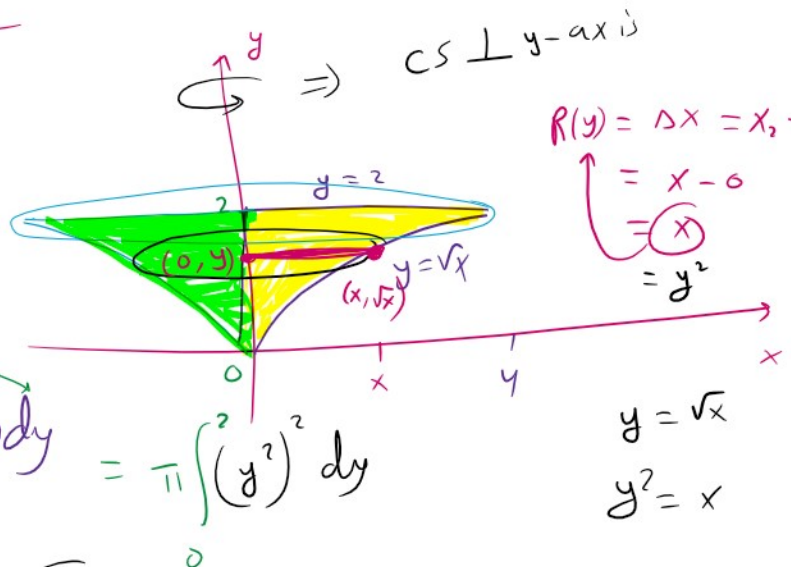
$$r(x) = y_2 - y_1 = \sqrt{x} - 0 = \sqrt{x}$$

(b) ↻ $\Rightarrow \underline{\underline{DM}}$
y-axis

$$V = \int_a^b A(y) dy = \pi \int_a^b R^2(y) dy$$

(c) ↗ (d) ↗ (e) ↗

$$= \pi \int_0^2 y^4 dy = \dots = \frac{32\pi}{5}$$



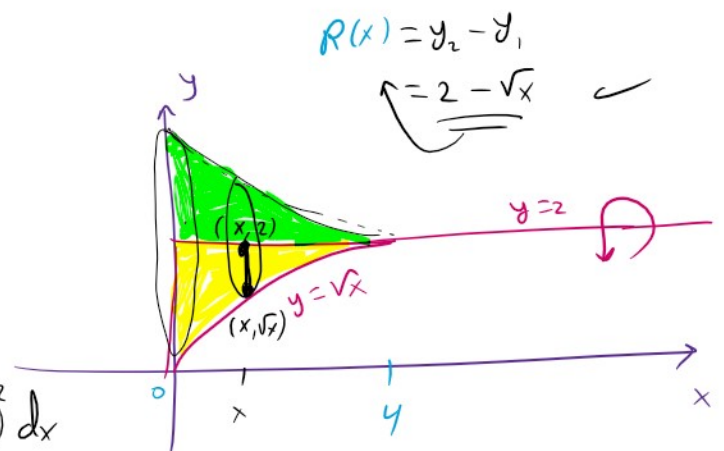
(c) ↻ $y=2$ $\parallel$ x-axis

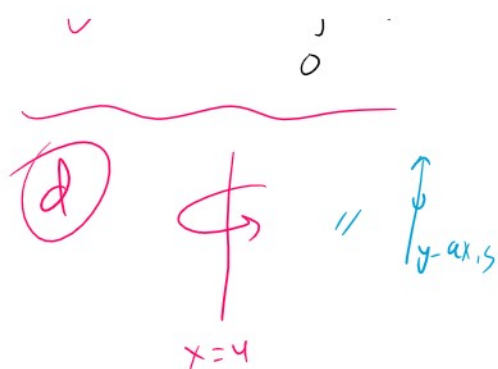
$\underline{\underline{DM}}$ ↗ $CS \perp y=2$ (x-axis)

$$V = \pi \int_a^b R^2(x) dx = \pi \int_0^4 (2 - \sqrt{x})^2 dx$$

(a) ↗ (b) ↗

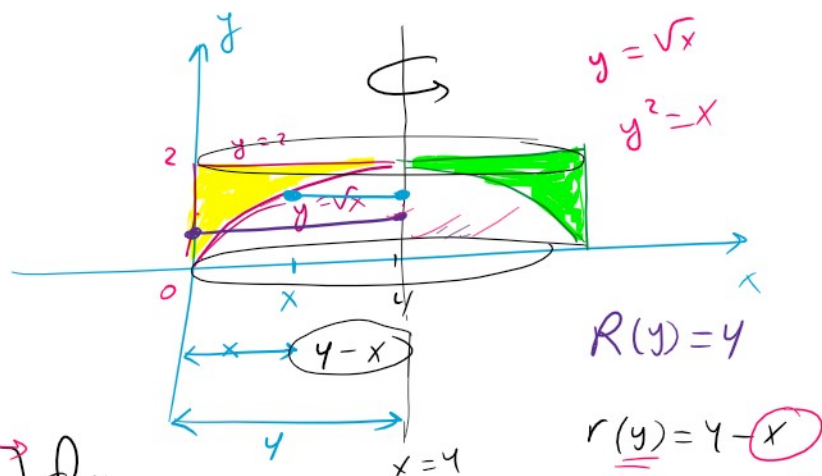
$$= \pi \int_0^4 (4 - 4\sqrt{x} + x) dx = \dots = \underline{\underline{\frac{8\pi}{3}}}$$





WM $\Rightarrow$ CS $\perp$ y -axis ($x=4$)

$$V = \pi \int_{[c]}^{[d]} \left[R^2(y) - \underbrace{r^2(y)}_{\text{inner}} \right] dy$$



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

$$= \pi \int_0^2 \left[16 - (16 - 8y^2 + y^4) \right] dy$$

$$= \dots = \frac{224}{15} \pi$$