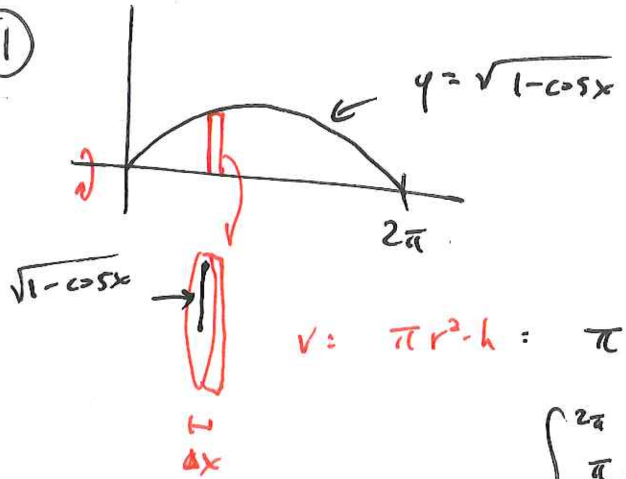
1.



$V = \pi r^2 \cdot h = \pi\left(\sqrt{1-\cos x}\right)^2 \cdot \Delta x$ ← vol. of 1 disk.

$$\int_0^{2\pi} \pi\left(\sqrt{1-\cos x}\right)^2 dx$$ ← vol of <u>all</u> disks

$$\pi \int_0^{2\pi} 1-\cos x \quad dx$$

Anti-deriv.

$$\pi\left[x - \sin x\right]_0^{2\pi}$$

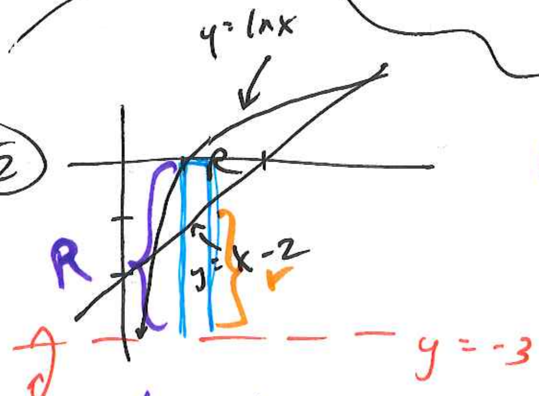
FTC #2

$$\pi\left[(2\pi - \sin 2\pi) - (0 - \sin 0)\right]$$

$$\pi\left[(2\pi - 0) - (0-0)\right]$$

$$\pi\left[2\pi\right] \rightarrow 2\pi^2$$

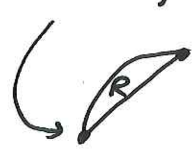
2.



$$V = \pi \int_?^? R^2 - r^2 \cdot dx$$

use Calc → 5: Intersect to find these

$(0.159, -1.841)$



$(3.146, 1.146)$

R: top − bottom

$\ln x - -3$

$= \ln x + 3$

r: top − bottom

$x-2 - -3$

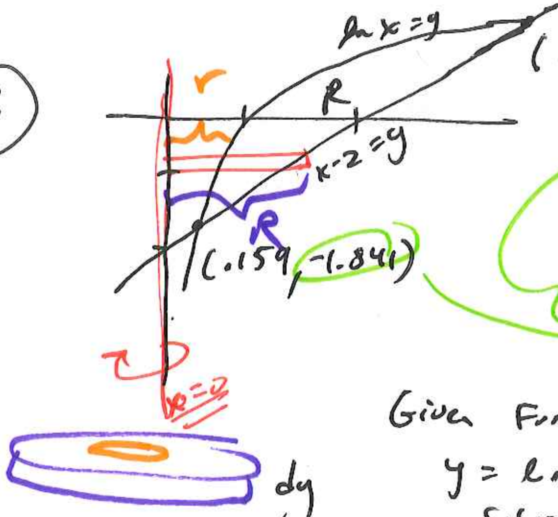
$x - 2 + 3$

$x+1$

$$\pi \int_{0.159}^{3.146} (\ln x + 3)^2 - (x+1)^2 \ dx$$

$$\boxed{\approx 10.886\pi \approx 34.199\ u^3}$$

(3)



y-axis ⇌ x = 0

$$V = \pi \int_c^d R^2 - r^2 \, dy$$

Given Functions:

$y = \ln x$	$y = x-2$
Solve for x	
* $x = e^y$	$x = y+2$ *

R: "Right - left"

$y+2-0$

$y+2$

r: "right - left"

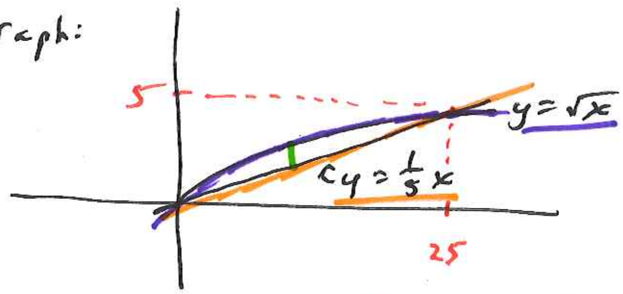
$e^y - 0$

e^y

$$V = \pi \int_{-1.841}^{1.146} (y+2)^2 - (e^y)^2 \, dy$$

$$\boxed{5.443\pi \approx 17.099 \, u^3}$$

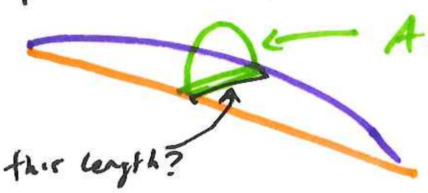
(4) Graph:



* Semicircle Area : $\frac{\pi}{8} D^2$ *

why? $\frac{1}{2}\pi r^2 \rightarrow \frac{\pi}{2}\left(\frac{D}{2}\right)^2$

$\frac{\pi}{2} \cdot \frac{D^2}{4} \rightarrow \frac{\pi}{8} D^2$



$$\frac{\pi}{8}(\text{Diameter})^2$$

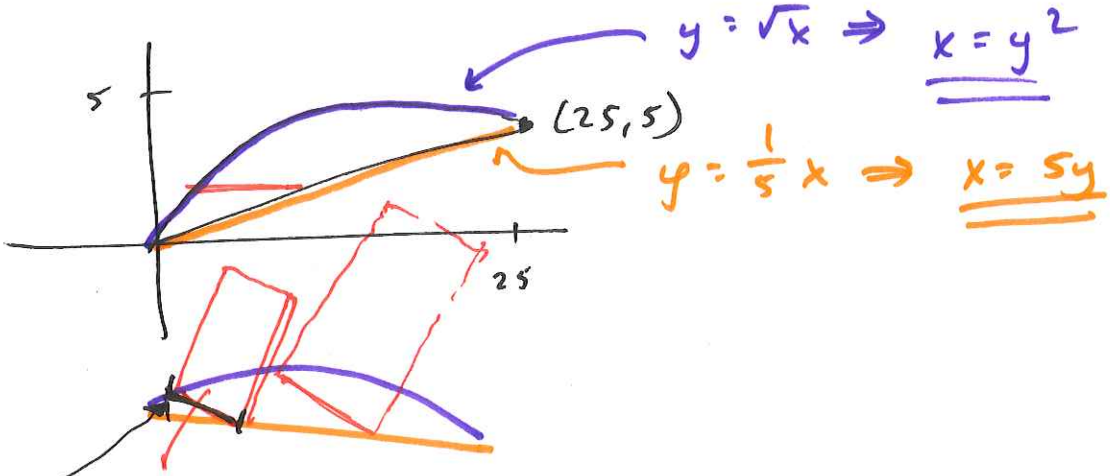
$$A(x) = \frac{\pi}{8}\left(\sqrt{x} - \frac{1}{5}x\right)^2$$

$$V = \underbrace{\frac{\pi}{8}\int_0^{25} \left(\sqrt{x} - \frac{1}{5}x\right)^2 dx}$$

$$\boxed{\frac{125}{48}\pi \approx 8.181 \, u^3} \leftarrow \frac{\pi}{8}\left(\frac{125}{6}\right)$$

about (20.833)

(5) * Note! Cross sections taken perpendicular to ~ y-axis!!



Area? BASE × HEIGHT.

this length "right - left"

"4 times longer than base"

$$A(y) = \underbrace{(5y - y^2)}_{\text{Base}} \cdot \underbrace{4(5y - y^2)}_{\text{Height}}$$

$$A(y) = 4(5y - y^2)^2$$

$$V = \int_0^5 4(5y - y^2)^2 \cdot dy \rightarrow$$

Note!

$$\boxed{\frac{1250}{3} \text{ units}^3}$$

⑥ Gen. Sol.

$$y' = 2y - 8$$

$$\frac{dy}{dx} = 2y - 8$$

$$dy = (2y-8)\,dx$$

) divide by $2y-8$

$$\int \frac{dy}{2y-8} = \int dx$$

$$\frac{1}{2}\int 2\,\frac{1}{2y-8}\,dy = x + C$$

want: 2

$$\frac{1}{2}\ln|2y-8| + C = x + C$$

$$\frac{1}{2}\ln|2y-8| = x + C$$

multiply by 2

$$\ln|2y-8| = 2x + C$$

exponentiate

$$e^{2x+C} = 2y - 8$$

$$e^{2x} \cdot \overset{C}{\cancel{e^{C}}} = 2y - 8$$

rewrite ~~right~~ left side using $x^a \cdot x^b \rightleftarrows x^{a+b}$

$$Ce^{2x} = 2y - 8$$

$$Ce^{2x} + 8 = 2y$$

$$\boxed{Ce^{2x} + 4 = y}$$

(7) Particular Sol. $y = f(x)$, $f(1) = 2$. $\rightarrow$ $\overset{x\ \ y}{(1, 2)}$

$$\frac{dy}{dx} = xy^3$$

$$dy = x \cdot y^3 \cdot dx$$

divide by y^3

$$\int \frac{dy}{y^3} = \int x \cdot dx$$

$$\int y^{-3} \cdot dy = \int x \cdot dx$$

$$-\frac{1}{2} y^{-2} + C = \frac{1}{2} x^2 + C$$

$$-2\left(-\frac{1}{2y^2} = \frac{1}{2}x^2 + C\right)-2$$

multiply all by -2

$$\frac{1}{y^2} = C - x^2$$

reciprocate

$$y^2 = \frac{1}{C - x^2}$$

$$y = \pm\sqrt{\frac{1}{C - x^2}}$$

$\leftarrow$ GENERAL SOLUTION

use $(1, 2)$, find C

$$2 = \sqrt{\frac{1}{C - 1^2}}$$

$\rightarrow$ square

$$4 = \frac{1}{C - 1}$$

$$4(C - 1) = 1$$

$$4C - 4 = 1$$

$$4C = 5$$

$$C = 5/4$$

Replace C in General Solution

$$y = \sqrt{\frac{1}{\frac{5}{4} - x^2}}$$

if you nasty:

$$y = \sqrt{\frac{4}{5 - 4x^2}}$$