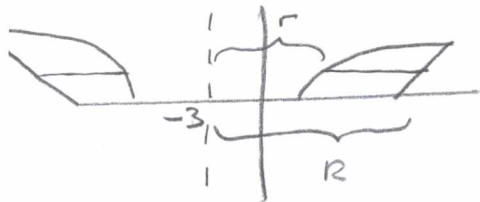


The region bounded by $y = \sqrt{x-1}$, $y = x-3$ and $y = 0$ is revolved around the line $x = -3$.

SCORE: _____ / 6 PTS

Write, **BUT DO NOT EVALUATE**, a **SINGLE** integral for the volume of the solid.



$$y = \sqrt{x-1} \rightarrow x = y^2 + 1$$

$$y = x-3 \rightarrow x = y+3$$

$$y^2 + 1 = y + 3 \rightarrow y^2 - y - 2 = 0$$

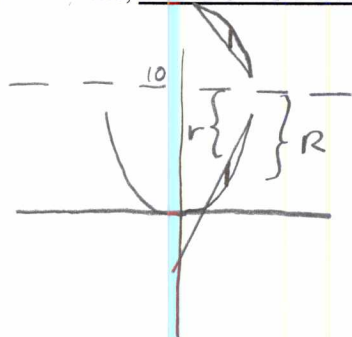
$$y = 2, -1$$

$$\pi \int_0^2 ((y+3-(-3))^2 - (y^2+1-(-3))^2) dy = \frac{1}{2} \pi \int_0^2 ((y+6)^2 - (y^2+4)^2) dy$$

The region bounded by $y = x^2$ and $y = 4x - 3$ is revolved around the line $y = 10$.

SCORE: ____ / 9 PTS

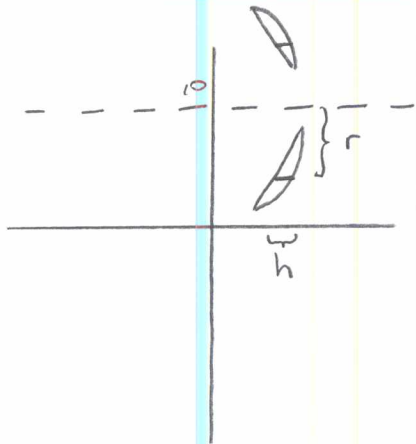
- [a] Write, **BUT DO NOT EVALUATE**, an integral (or sum of integrals) for the volume of the solid using the disk or washer method.



$$x^2 = 4x - 3 \rightarrow x^2 - 4x + 3 = 0$$
$$x = 1, 3$$

$$\pi \int_1^3 ((10 - x^2)^2 - (10 - (4x - 3))^2) dx$$
$$= \pi \int_1^3 ((10 - x^2)^2 - (13 - 4x)^2) dx$$

[b]

Write, **BUT DO NOT EVALUATE**, an integral (or sum of integrals) for the volume of the solid using the shell method.

$$x=1, 3 \rightarrow y=1, 9$$

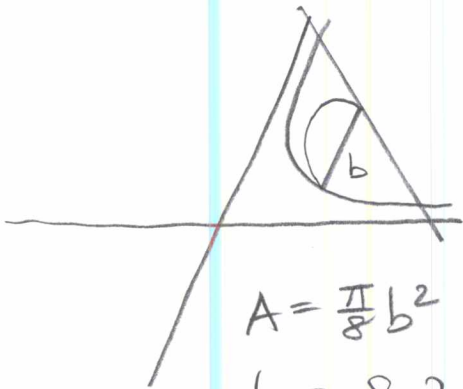
$$y=x^2 \rightarrow x=\sqrt{y} \quad \text{SINCE } x \geq 0$$

$$y=4x-3 \rightarrow x=\frac{1}{4}(y+3)$$

$$2\pi \int_1^9 (10-y)(\sqrt{y} - \frac{1}{4}(y+3)) dy$$

$$= 2\pi \int_1^9 (10-y)(-\frac{1}{4}y + \sqrt{y} - \frac{3}{4}) dy$$

The base of a solid is the region bounded by $y = \frac{6}{x}$ and $y = 8 - 2x$. Cross sections perpendicular to the x -axis are semicircles. Write, **BUT DO NOT EVALUATE**, an integral (or sum of integrals) for the volume of the solid. SCORE: _____ / 5 PTS



$$A = \frac{\pi}{8} b^2$$

$$b = 8 - 2x - \frac{6}{x}$$

$$\frac{6}{x} = 8 - 2x \rightarrow 6 = 8x - 2x^2$$

$$\rightarrow 2x^2 - 8x + 6 = 0$$

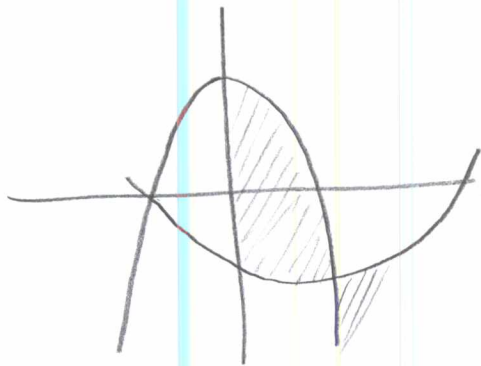
$$\rightarrow x^2 - 4x + 3 = 0$$

$$x = 1, 3$$

$$\frac{\pi}{8} \int_1^3 \left(8 - 2x - \frac{6}{x} \right)^2 dx$$

Find the area between the curves $y = 3 - 3x^2$ and $y = x^2 - 4x - 5$ over the interval $0 \leq x \leq 3$.

SCORE: ____ / 6 PTS



$$3 - 3x^2 = x^2 - 4x - 5 \rightarrow 4x^2 - 4x - 8 = 0$$

$$\rightarrow x^2 - x - 2 = 0$$

$$x = -1, 2$$

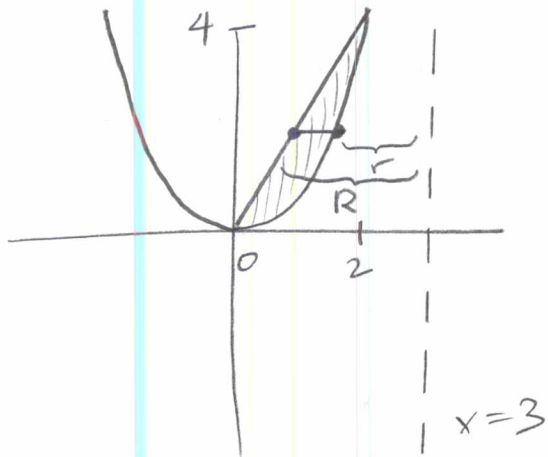
$$\int_0^2 (3 - 3x^2 - (x^2 - 4x - 5)) dx \\ + \int_2^3 (x^2 - 4x - 5 - (3 - 3x^2)) dx$$

$$= \int_0^2 (8 + 4x - 4x^2) dx + \int_2^3 (4x^2 - 4x - 8) dx \quad \textcircled{3}$$

$$\textcircled{2} \left(8x + 2x^2 - \frac{4}{3}x^3 \right) \Big|_0^2 + \left(\frac{4}{3}x^3 - 2x^2 - 8x \right) \Big|_2^3 = \frac{40}{3} + \frac{22}{3} = \frac{62}{3} \quad \textcircled{1}$$

SCORE: ____ / 4 PTS

A solid is created by revolving a region around an axis of revolution. Sketch the region and find the equation of the axis of revolution if the volume of the solid is $\pi \int_0^4 ((3 - \sqrt{y})^2 - (3 - \frac{1}{2}y)^2) dy$.



①

$$x = \sqrt{y} \rightarrow y = x^2$$

$$x = \frac{1}{2}y \rightarrow y = 2x$$

①

BONUS POINT
IF YOU REALIZED
ORDER OF
SUBTRACTION
WAS REVERSED

① FOR SKETCHING AXIS @ $x=3$

① " " $y=2x$

① " " $y=x^2$

① FOR SHADING CORRECT REGION

↑ OR SOMEHOW
INDICATING