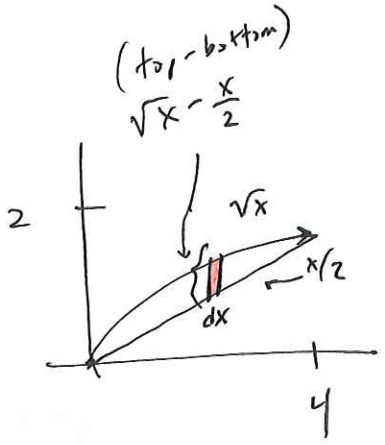
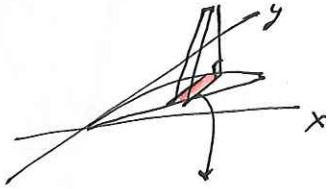
#1.

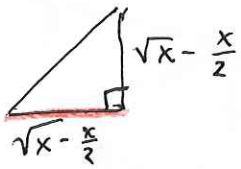
(1) Graph Equations/Base Region; Find Intersections if Needed.

(2) Draw representative Rectangle, 3D view and 2D view of cross section

(3) Find Area of Cross section $A(x)$ in terms of x







$$V = \int_a^b \underbrace{A(x)}_{\text{Face Area of Cross-Section}} dx$$

$$A(x) = \frac{1}{2} b \cdot h = \frac{1}{2}\left(\sqrt{x} - \frac{x}{2}\right)\left(\sqrt{x} - \frac{x}{2}\right)$$

$$A(x) = \frac{1}{2}\left(x - x^{3/2} + \frac{1}{4}x^2\right)$$ "FOIL", etc.

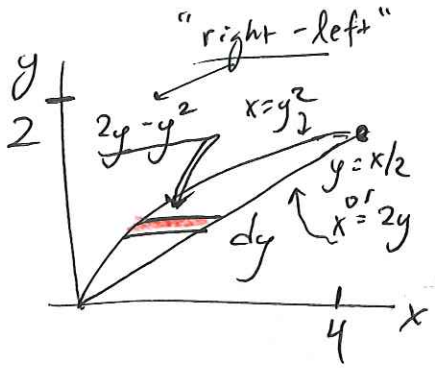
$$V = \int_0^4 \frac{1}{2}\left(x - x^{3/2} + \frac{1}{4}x^2\right) dx$$

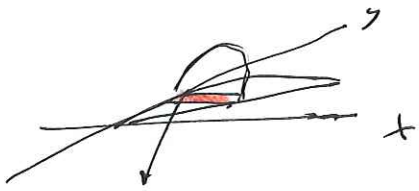
$$V = \frac{1}{2}\int_0^4 x - x^{3/2} + \frac{1}{4}x^2 \, dx$$) Calc. (Not hard by hand)

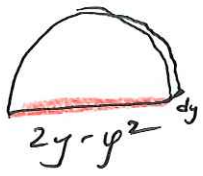
$$= \frac{1}{2}\left(\frac{8}{15}\right)$$

$$= \boxed{\frac{8}{30} \text{ cubic units}}$$

#2.







Diameter: $2y-y^2$

Radius: $y-\frac{1}{2}y^2$

$$A(y) = \frac{1}{2}\cdot \pi r^2$$

$$A(y) = \frac{\pi}{2}\left(y-\frac{1}{2}y^2\right)^2$$

$$V = \int_0^2 \frac{\pi}{2}\left(y-\frac{1}{2}y^2\right)^2 dy$$

$$= \frac{\pi}{2}\int_0^2 \left(y-\frac{1}{2}y^2\right)^2 dy$$ CALC.

$$= \frac{\pi}{2}\cdot\frac{4}{15}$$

$$= \frac{4\pi}{30} \rightarrow \frac{2\pi}{15} \text{ cubic units}$$

D-DE4

Consider the differential equation $\frac{dy}{dx} = \frac{x-1}{y^2}$

3. On the axes provided, sketch a slope field at the points indicated.

4. While only some points are graphed, the slope field drawn in the previous problem is defined for many others. Describe all points in the xy-plane that have negative slope.

x	y	dy/dx
0	1	-1
0	2	-1/4
1	1	0
1	2	0
2	1	1
2	2	1/4
-1	1	-2
-1	2	-1/2

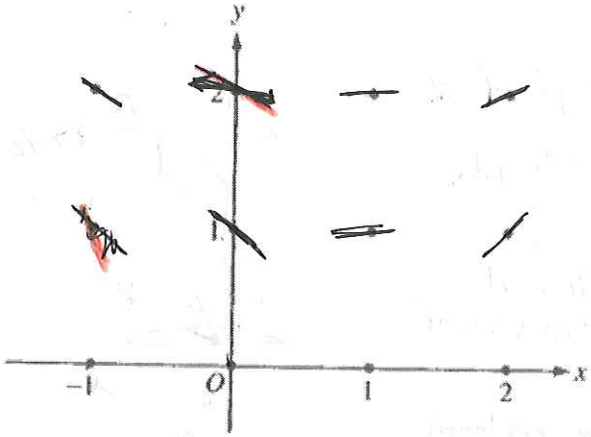
$\frac{dy}{dx} = \frac{x-1}{y^2}$

↑ Always positive

So when is $x-1$ negative?

$x-1 < 0$

$x < 1$



D-DE5

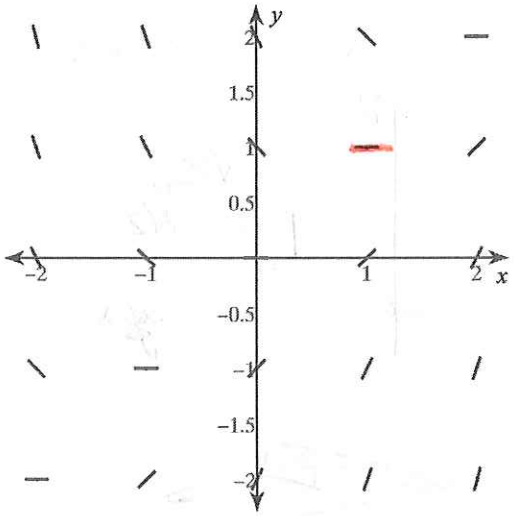
5. Choose the differential equation that could be represented by the given slope field.

A) $\frac{dy}{dx} = \frac{x}{y}$

B) $\frac{dy}{dx} = xy$

C) $\frac{dy}{dx} = x - y$

D) $\frac{dy}{dx} = x + y$



pick a representative pt like (1,1)

Pt	A	B	C	D
(1,1)	1	1	0	2
	x	x	✓	x

(Slope is 0)