Wk 13 — Thurs

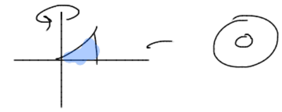
- Study guide for exam 4 — posted.

- Tips for Volumes of Solids of Revolution

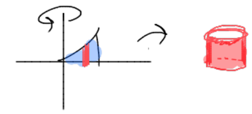
① Is the axis vertical ↕ or horizontal ↔ ?

$x = 2$, $x = -1$ $y = 3$, $y = -1$

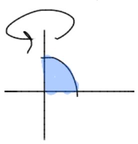
② vertical: Washer / Disc Method ⟶ int. wrt y.



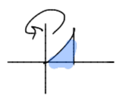
Shell Method ⟶ int. wrt x



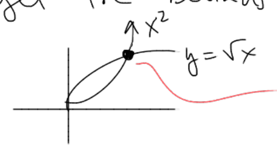
③ Does your area share an edge with the axis?



Yes ⇒ slices are DISCS ⇒ disc method

No  ⇒ slices are washers ⇒ washer method or shell.

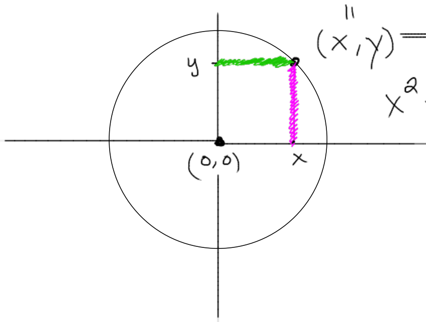
④ Bounds $\int_{min}^{max}$, get the bounds by setting two functions equal.



solve $x^2 = \sqrt{x}$

⑤

$(\sqrt{r^2 - y^2}, y)$ (helpful when you know the y-coord)

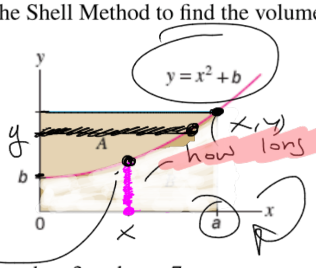


$(x, y) = (x, \sqrt{r^2 - x^2})$ (helpful when you know the x-coord)

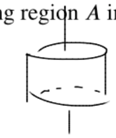
$x^2 + y^2 = r^2$

Question 7 of 8

Use the Shell Method to find the volume of the solid obtained by rotating region A in the figure about the x-axis.



Shell:



y-axis
rev.
shell

how long is this segment?

Assume $b = 3$ and $a = 7$.

height

radius – [touch axis & curve]

axis of shell is parallel to axis of rev.

(x, y)
$=$
$(x, x^2 + b)$

segment is $y = x^2 + b$ in length

$r = y = x^2 + b$

How long is black segment = height of shell?

x-coord!! solve for x!

$y = x^2 + b$

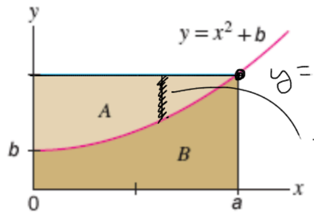
$\sqrt{y-b} = x$ = height

integrate ⊥ to axis of rev.

$$\int_{\min}^{\max} \quad dy = \int_b^{a^2+b} 2\pi \cdot y \cdot f(y)\,dy = \int_b^{a^2+b} 2\pi \cdot y \cdot \sqrt{y-b}\,dy$$

Question 8 of 8

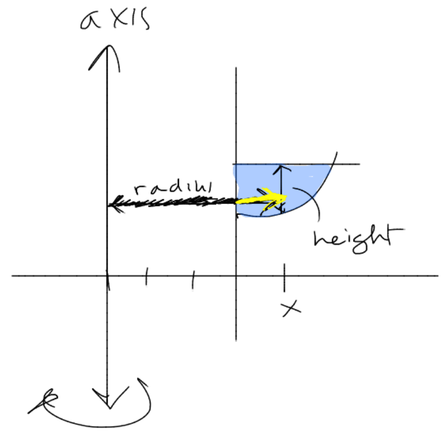
Use the Shell Method to find the volume of the solid obtained by rotating the region A in the figure about $x = -3$.



$y = a^2 + b = 37$

length $= 37 - y = 37 - (x^2 + 1)$

$= 36 - x^2$



Assume $b = 1$, $a = 6$.

Int. wrt x,

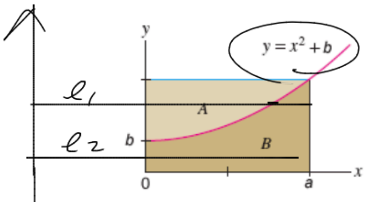
variables: in terms of x

radius $= x - (-3) = x + 3$

height $= 36 - x^2$

Question 6 of 8

Use the most convenient method (Disk or Shell Method) to find the volume of the solid obtained by rotating region ***B*** in the figure about the line $x = -3$.



Assume $a = 3$ and $b = 4$.

$\int$ Washer Area dy — inner radius changes above / below b.

or

$\int$ Vol Shell dx