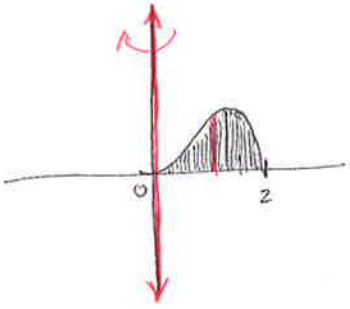
Math 76 Exercises -- 2.3B More Practice with Volume

Disks or Shells? Decide if the following problems would be easier solved using the **disk** method or the **shell** method, or whether either method could be used. If your answer is "either," explain how to set the problem up each way.

Note. **RBB** stands for "The region bounded by ...".

1. RBB $y = 2x^2 - x^3$, $y = 0$ about the y-axis — **SHELLS**

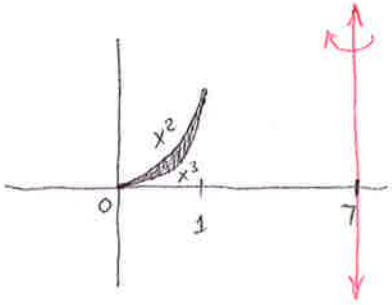


(Region formed from functions of x, rotated about a vertical axis.)

$r = x$, $h = 2x^2 - x^3$

Integrate from 0 to 2

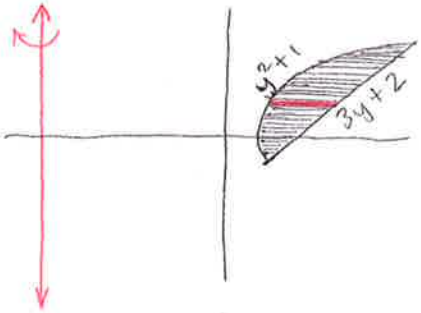
2. RBB $y = x^3$, $y = x^2$ about the line $x = 7$ — **EITHER**



In terms of x: shells : $r = 7 - x$, $h = x^2 - x^3$

In terms of y: disks: $R = 7 - \sqrt{y}$, $r = 7 - \sqrt[3]{y}$

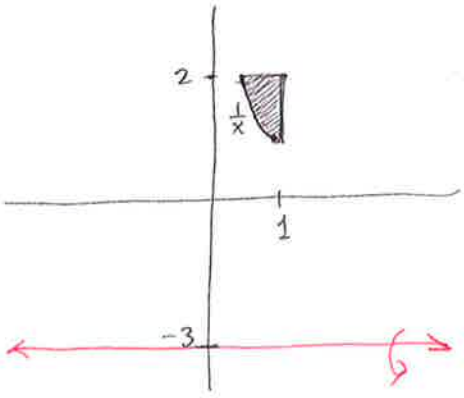
3. RBB $x = y^2 + 1$, $x = 3y + 2$ about the line $x = -16$ — **DISKS**



(Region formed from functions of y, rotated about a vertical axis)

$R = (3y - 2) + 16$, $r = (y^2 + 1) + 16$

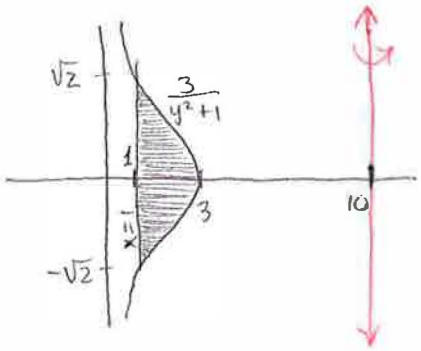
4. RBB $y = \frac{1}{x}$, $y = 2$, $x = 1$ about the line $y = -3$ — **EITHER**



In terms of x: disks : $R = 5$, $r = \frac{1}{x} + 3$

In terms of y: shells : $r = y + 3$, $h = 1 - \frac{1}{y}$

5. RBB $x = \dfrac{3}{y^2+1}$, $x = 1$ about the line $x = 10$ — **DISKS**

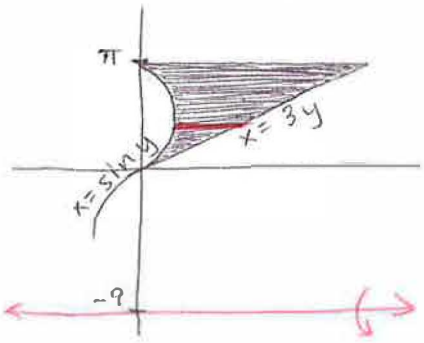


(Region formed from functions of y about a vertical axis)

$R = 9$, $r = 10 - \dfrac{3}{y^2+1}$,

integrate from $-\sqrt{2}$ to $\sqrt{2}$

6. RBB $y = \dfrac{x}{3}$, $x = \sin y$, $y = \pi$ about the line $y = -9$ — **SHELLS**



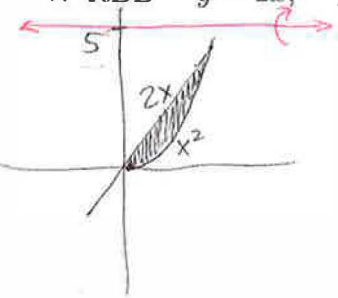
(Region formed from functions of y about a horizontal axis)

$r = y + 9$

$h = 3y - \sin y$

integrate from 0 to π

7. RBB $y = 2x$, $y = x^2$ about the line $y = 5$ — **EITHER**



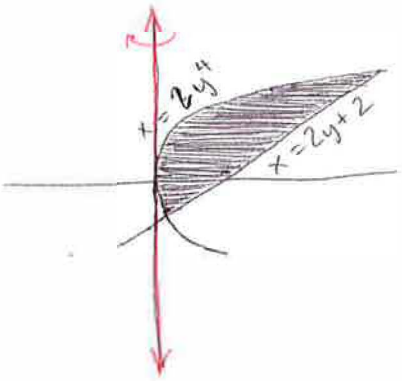
In terms of x : disks : $R = 5 - x^2$, $r = 5 - 2x$,

integrate from 0 to 2.

In terms of y : shells : $r = 5 - y$, $h = \sqrt{y} - \frac{1}{2}y$,

integrate from 0 to 4.

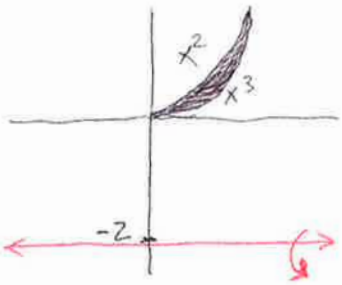
8. RBB $x = 2y^4$, $y = \dfrac{1}{2}x - 1$ about the y-axis — **DISKS**



(Region formed from functions of y about a vertical axis)

$R = 2y + 2$, $r = 2y^4$

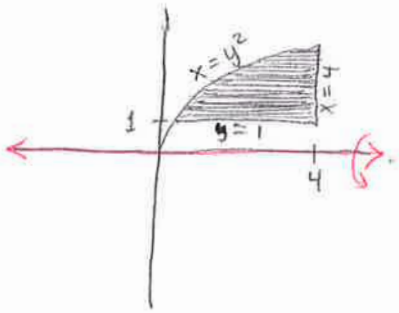
9. RBB $y = x^3$, $y = x^2$ about the line $y = -2$ — EITHER



In terms of x: disks: $R = x^2 + 2$, $r = x^3 + 2$

In terms of y: shells: $r = y + 2$, $h = \sqrt[3]{y} - \sqrt{y}$

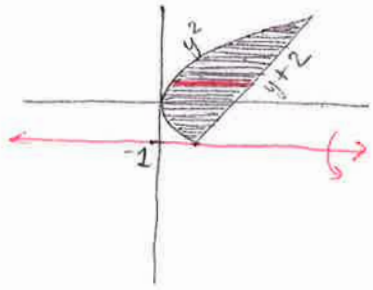
10. RBB $x = y^2$, $x = 4$, $y = 1$ about the x-axis — **EITHER**



In terms of y: shells: $r = y$, $h = 4 - y^2$,
integrate from 1 to 2

In terms of x: disks: $R = \sqrt{x}$, $r = 1$,
integrate from 1 to 4

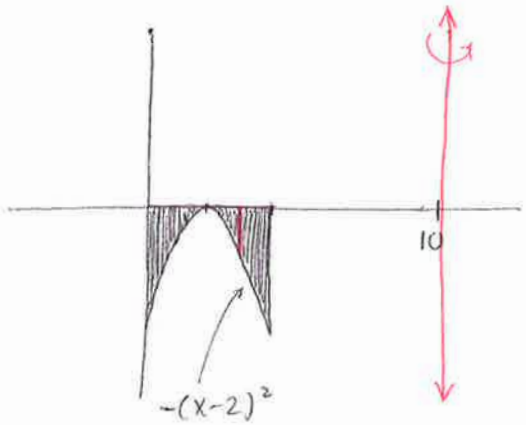
11. RBB $y = x - 2$, $x = y^2$ about the line $y = -1$ — **SHELLS**



(Region formed by functions of y about a horizontal axis)

$r = y + 1$, $h = y + 2 - y^2$

12. RBB $y = -(x-2)^2$, $x = 4$, $y = 0$ about the line $x = 10$ — **SHELLS**



(Region formed from functions of x about a vertical axis)

$r = 10 - x$, $h = 0 - (-(x-2)^2)$

$= (x-2)^2$,

integrate from 0 to 4.