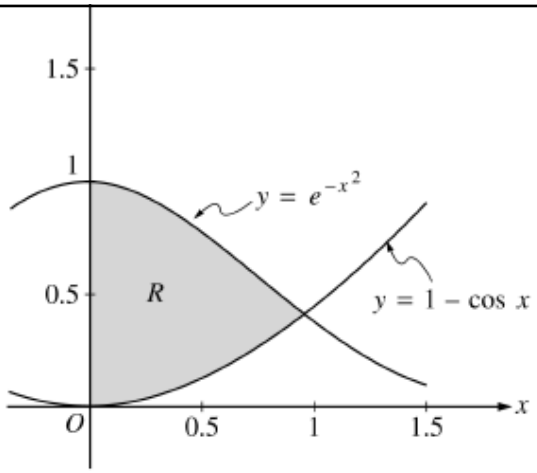


1. Let R be the shaded region in the first quadrant enclosed by the graphs of $y = e^{-x^2}$, $y = 1 - \cos x$, and t
y-axis, as shown in the figure above.

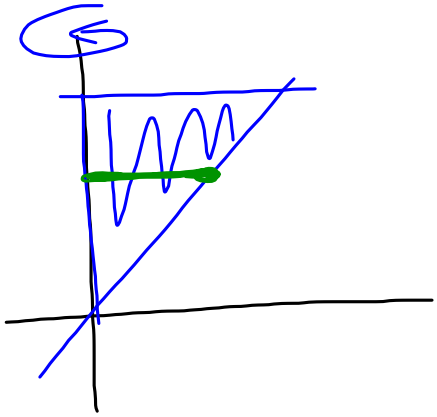
(a) Find the area of the region R.

$$\int_0^{.942} e^{-x^2} - (1 - \cos x)\, dx$$

VOLUME: DISKS

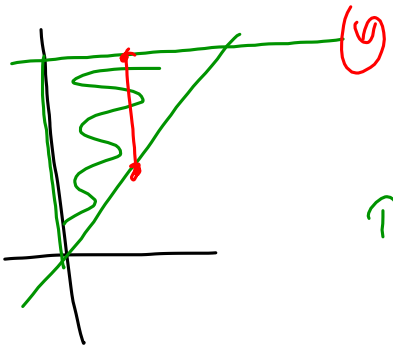
Ex 1: Find the volume if the region enclosing $y = 2x$, $y = 6$, $x = 0$ is rotated about the y axis

$y = 2$



$$\pi \int_0^6 \left(\frac{y}{2}\right)^2 dy$$

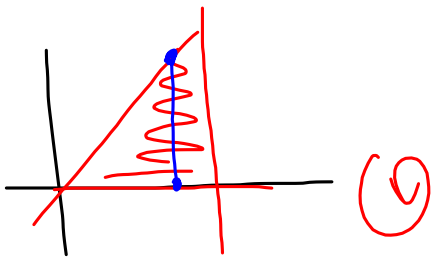
Ex 2: Find the volume if the region enclosing $y = 2x$, $y = 6$, $x = 0$ is rotated about y=6



$$\pi \int_0^3 (6 - 2x)^2 \, dx$$

VOLUME: DISKS

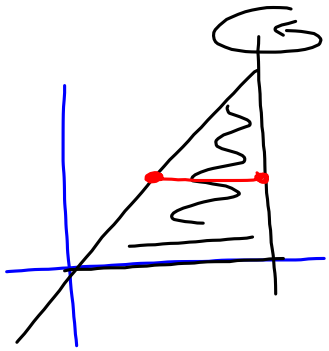
Ex 1: Find the volume if the region enclosing $y = 2x$, $y = 0$, $x = 3$ is rotated about the x axis



$$\pi \int_0^3 (2x)^2 \, dx$$

Ex 2: Find the volume if the region enclosing $y = 2x$, $y = 0$, $x = 3$ is rotated about $x=3$

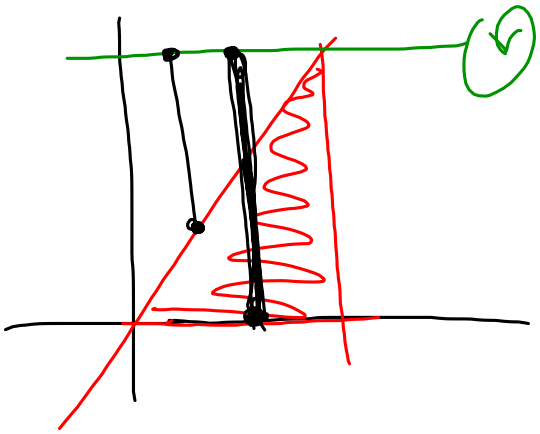
$y = 2x \Rightarrow x = \frac{y}{2}$



$$\pi \int_0^6 \left(3 - \frac{y}{2}\right)^2 dy$$

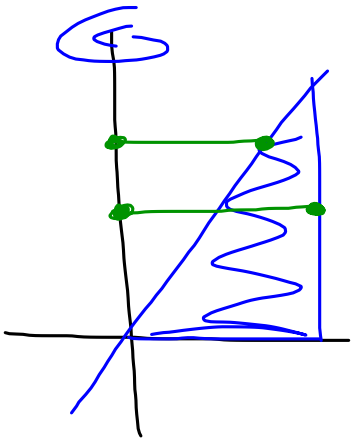
VOLUME: WASHERS

Ex 1: Find the volume if the region enclosing $y = 2x$, $y = 0$, $x = 3$ is rotated about $y=6$



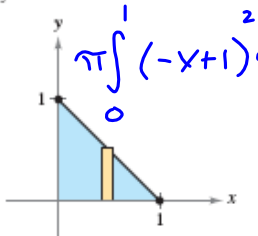
$$\pi \int_0^3 (6)^2 - (6-2x)^2 \, dx$$

Ex 1: Find the volume if the region enclosing $y = 2x$, $y = 0$, $x = 3$ is rotated about the y-axis



$$\pi \int_0^6 (3)^2 - \left(\frac{y}{2}\right)^2 dy$$

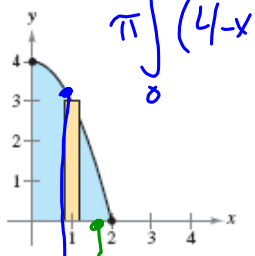
1. $y = -x + 1$



$$\pi \int_0^1 (-x+1)^2 dx$$

Shell

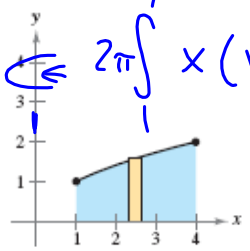
2. $y = 4 - x^2$



$$\pi \int_0^2 (4-x^2 - -2)^2 - (2)^2 \, dx$$

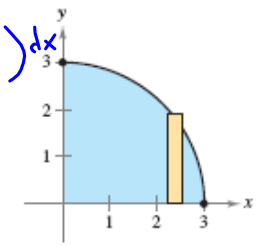
$y = -2$

3. $y = \sqrt{x}$



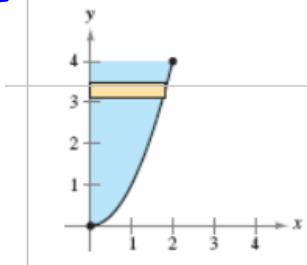
$$2\pi \int_1^4 x(\sqrt{x})\,dx$$

4. $y = \sqrt{9 - x^2}$

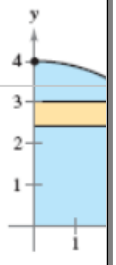


In Exercises 7–10, set up and evaluate the inte volume of the solid formed by revolving the y-axis.

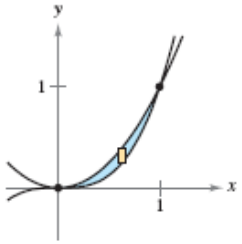
7. $y = x^2$



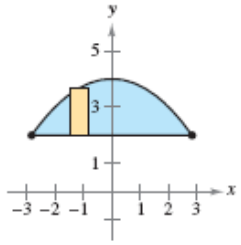
8. $y = \sqrt{16}$



5. $y = x^2$, $y = x^3$

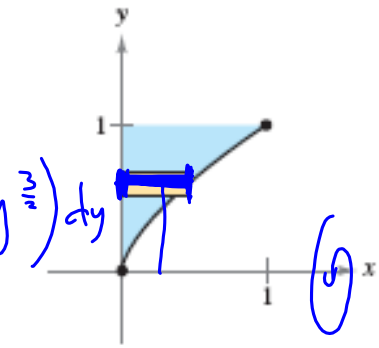


6. $y = 2$, $y = 4 - \frac{x^2}{4}$



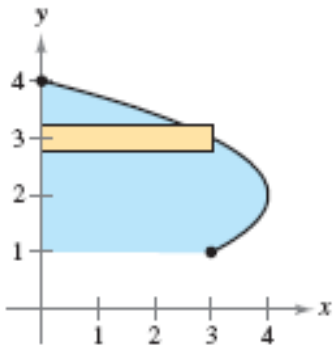
$x = y^{\frac{3}{2}}$

9. $y = x^{2/3}$



$2\pi \int_0^1 y\left(y^{\frac{3}{2}}\right) dy$

10. $x = -y^2 + 4y$



In Exercises 11–14, find the volume of the solid generated by revolving the region bounded by the graphs of the equations about the given lines.

11. $y = \sqrt{x}$, $y = 0$, $x = 4$

(a) the x-axis (b) the y-axis

(c) the line $x = 4$ (d) the line $x = 6$

Work: find the work required to pull a leaky 5 lb pail with 6 ft^3 of water at the start. It looses $\frac{1}{3}$ of the water over 10 ft.

Pail:

$W = 5 \cdot 10 =$

50 ft.-lb.

Water:

$W = \int_0^{10} 62.4\left(6 - \frac{2}{10}x\right)$

Work

Move a spring 3 inches if

300 lb moves a spring 1 inch.

$F = kx$

$300 = k \cdot 1 \quad k = 300$

$F = 300x$

$$\int_0^3 300x\,dx$$

Find the work done in pulling a leaky pail that weighs 5 lbs. It begins w/ 3 gallons of water and holds $\frac{1}{2}$ that amount after 10 ft.

8 lb. / gal.

Pail

50 ft. lb. +

Water

$$\int_0^{10} 8\left(3 - \frac{1.5}{10}x\right)dx$$

Work:

30 ft. Rope that weight .2 $\frac{lb}{ft.}$ find the work to lift 20 ft. of rope.

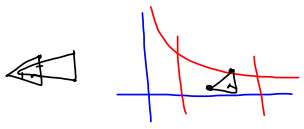
$$W = \int_0^{20} .2(30 - x)\,dx$$

(30 − x): length

$6 - .2x$

$\frac{1}{x}$ from 1 to 3 has cross-sections $\perp$ to x-axis in the shape of isosceles rt. Δ's. (w/ base $\perp$)

Find Volume:



$$\int \frac{1}{2} s^2$$

$$\int_1^3 \frac{1}{2}\left(\frac{1}{x}\right)^2 dx$$

$$\frac{1}{2}\int_1^3 x^{-2}\,dx$$

$$\frac{1}{2}\left(-x^{-1}\right)_1^3$$

Attachments

Calc - WS on Differential Equations.doc