Calculus

11.3 Solids of Revolution (Washers)

Name:_____

Write your questions and thoughts here!

Notes

Recall:

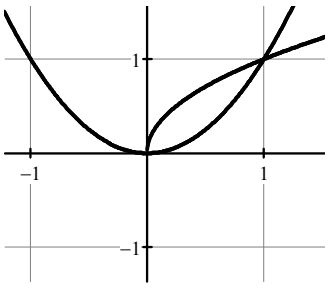
- Disc cross-sections

Volume of a Solid of Revolution (washers)

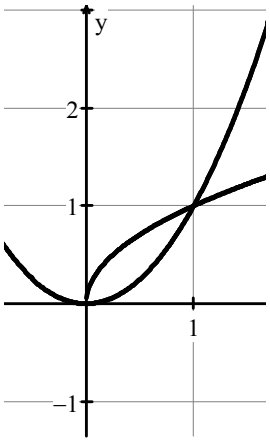
$$V = \pi \int_a^b$$

where is the radius to the of the object and
is the radius to the of the object.

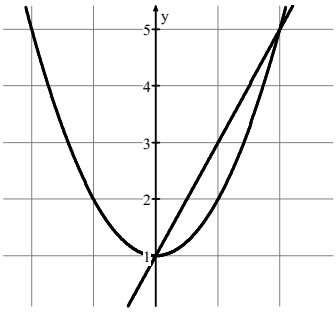
1. Find the volume if the region enclosed by $y = \sqrt{x}$, and $y = x^2$ is rotated about the x-axis.



2. Find the volume if the region enclosed by $y = \sqrt{x}$, and $y = x^2$ is rotated about the line $y = 1$.

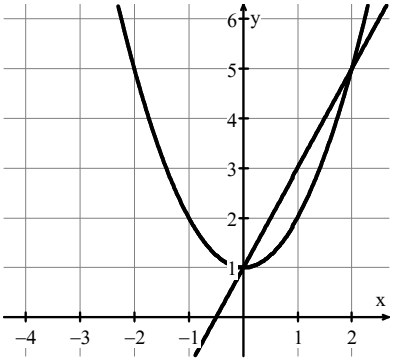


3. Find the volume if the region enclosed by $y = x^2 + 1$ and $y = 2x + 1$ is rotated about the y-axis.

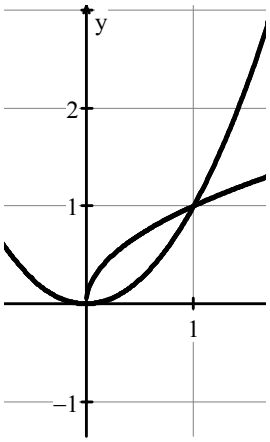


Write your questions and thoughts here!

4. Find the volume if the region enclosed by $y = x^2 + 1$ and $y = 2x + 1$ is rotated about the line $x = -1$.



5. Find the volume if the region enclosed by $y = \sqrt{x}$, and $y = x^2$ is rotated about the line $y = 1$.



Now summarize what you learned!

11.3 Solids of Revolution (Washers)

Calculus

Practice

Find the volume of the solid formed by revolving the region about the x-axis.

1. $y = x^2,\ y = x^3$

2. $y = \sqrt{x},\ x = 0,\ y = 2$

Find the volume of the solid formed by revolving the region about the y-axis.

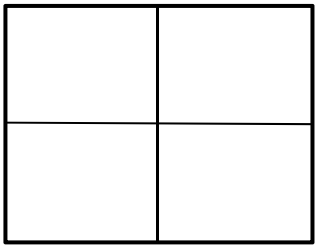
3. $y = x^2,\ y = x^3$

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

5. Sketch the graph and find the area of the region bounded by $y = x,\ x = 0$, and $y = 3$

Set up the integral to find the volume when revolving it about the given line. DO NOT EVALUATE!

a. The x-axis.

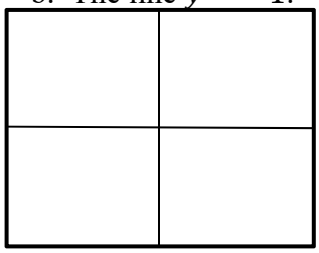


$R =$

$r =$

$V =$

b. The line $y = -1$.

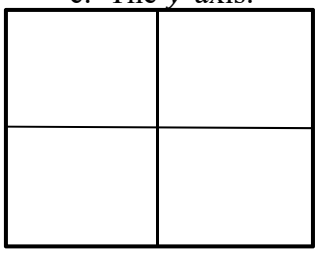


$R =$

$r =$

$V =$

c. The y-axis.

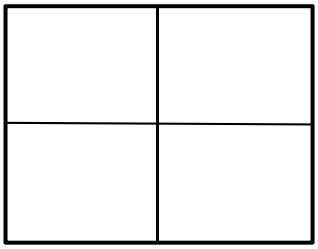


$R =$

$r =$

$V =$

d. The line $x = 3$.

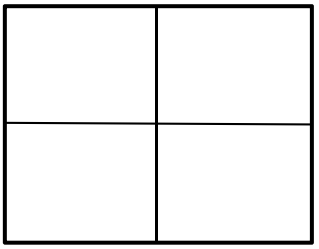


$R =$

$r =$

$V =$

e. The line $x = -1$.



$R =$

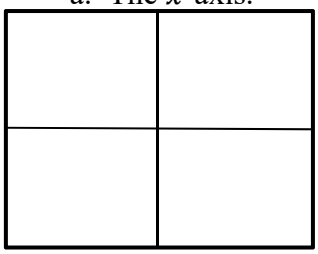
$r =$

$V =$

6. Sketch the graph and find the area of the region bounded by $y = x^2$ and $y = 4x - x^2$.

Set up the integral to find the volume when revolving it about the given line.
$y = x^2$ and $y = 4x - x^2$. DO NOT EVALUATE!

a. The x-axis.

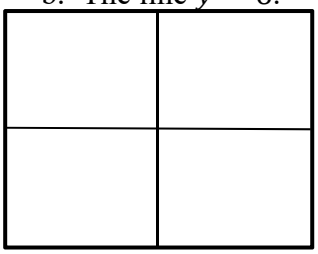


$R =$

$r =$

$V =$

b. The line $y = 6$.



$R =$

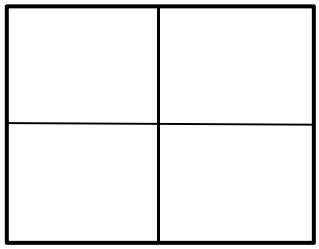
$r =$

$V =$

7. Sketch the graph and find the area of the region bounded by $y = x^2$, and $y = \sqrt[3]{x}$

Set up the integral to find the volume when revolving it about the given line. DO NOT EVALUATE!

a. The x-axis.

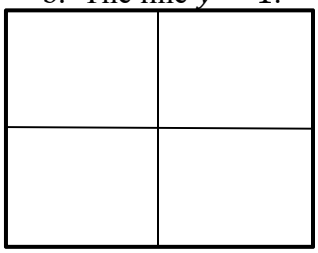


$R =$

$r =$

$V =$

b. The line $y = 1$.

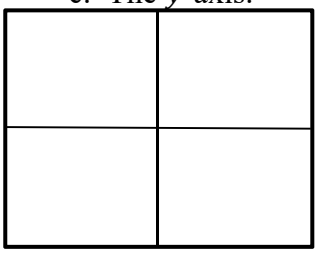


$R =$

$r =$

$V =$

c. The y-axis.



$R =$

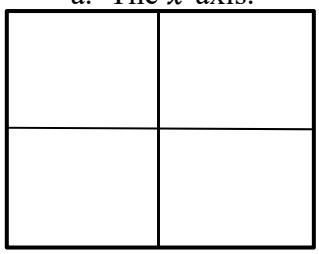
$r =$

$V =$

8. Sketch the graph and find the area of the region bounded by $y = x^3$, $x = 0$, and $y = 8$.

Set up the integral to find the volume when revolving it about the given line.
$y = x^3,\ x = 0$, and $y = 8$. DO NOT EVALUATE!

a. The x-axis.

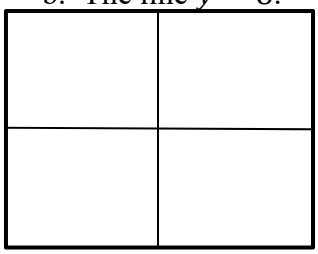


$R =$

$r =$

$V =$

b. The line $y = 8$.

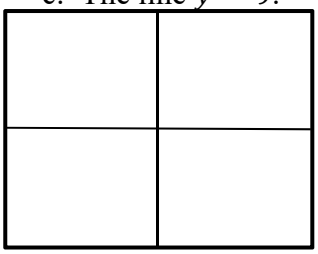


$R =$

$r =$

$V =$

c. The line $y = 9$.

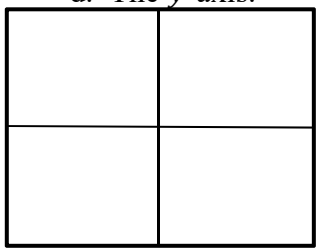


$R =$

$r =$

$V =$

d. The y-axis.

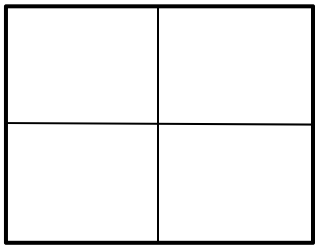


$R =$

$r =$

$V =$

e. The line $x = 2$.

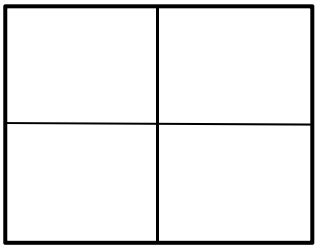


$R =$

$r =$

$V =$

f. The line $x = 3$.



$R =$

$r =$

$V =$

11.3 Solids of Revolution (Washers)

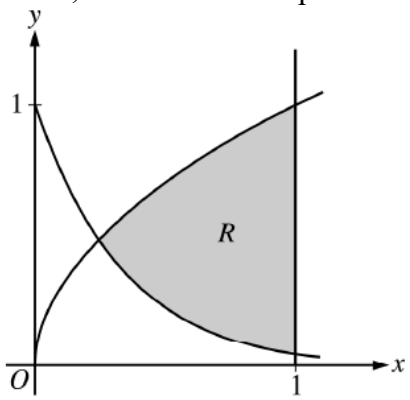
Test Prep

1. The area bounded by the curves $y = x^2 + 4$ and $y = -2x + 1$ between $x = -2$ and $x = 5$ equals

(A) 86.500 (B) 86.425 (C) 86.333 (D) 86.125 (E) 86.000

2003 Form A #1 [calculator allowed]

You already did "part a" in the 11.1 packet, so the answer is provided for you. Now do part b.



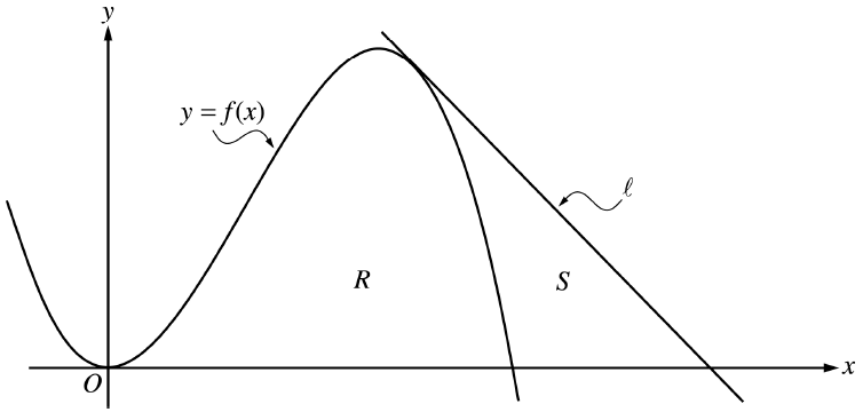
Let R be the shaded region bounded by the graphs of $y = \sqrt{x}$ and $y = e^{-3x}$ and the vertical line $x = 1$, as shown in the figure above.

(a) Find the area R.
Point of intersection: $e^{-3x} = \sqrt{x}$ at $(0.238734,\ 0.488604)$
Area $= \int_{0.238734}^{1} \left(\sqrt{x} - e^{-3x}\right) dx$

(b) Find the volume of the solid generated when R is revolved about the horizontal line $y = 1$.

2003 Form B #1 [calculator allowed]

You already did parts "a" and "b" in the 11.1 packet.



Let f be the function given by $f(x) = 4x^2 - x^3$, and let ℓ be the line $y = 18 - 3x$, where ℓ is tangent to the graph of f. Let R be the region bounded by the graph of f and the x-axis, and let S be the region bounded by the graph of f, the line l, and the x-axis, as shown above.

(c) Find the volume of the solid generated when R is revolved about the x-axis.