Calculus

11.4 Perpendicular Cross Sections

Name:_____

Write your questions and thoughts here!

Notes

Volume of a Solid with known Cross Sections

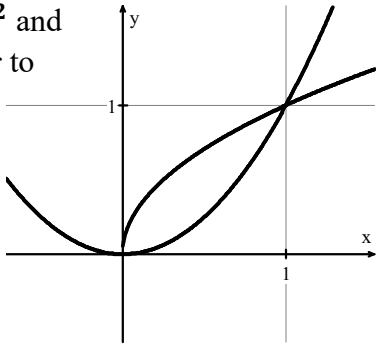
$$V =$$

where is the of a cross section perpendicular to the x-axis.

Area of various geometric shapes

Square: $\boldsymbol{A} =$	Equilateral triangle: $\boldsymbol{A} =$
Semicircle: $\boldsymbol{A} =$	Isosceles right triangle: $\boldsymbol{A} =$ with hypotenuse $\boldsymbol{h} =$

1. Find the volume of the solid whose base is bounded by $\boldsymbol{y = x^2}$ and $\boldsymbol{y = \sqrt{x}}$, with the indicated cross sections taken perpendicular to the $\boldsymbol{x}$-axis.



a.) Square

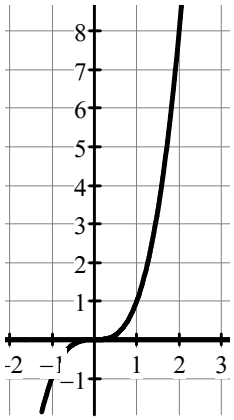
b.) Equilateral triangle

c.) Semicircle

d.) Isosceles right triangle (side is the base)

Write your questions and thoughts here!

2. Find the volume of the solid whose base is bounded by $y = x^3$, $y = 0$, and $x = 2$ with cross sections taken perpendicular to the y-axis that form a square.



Now summarize what you learned!

11.4 Perpendicular Cross Sections

Calculus

Practice

The base of an object is bounded by the lines $y = x - 4, y = 4 - x$, and $x = 0$. Find the volume of the object with the indicated cross sections taken perpendicular to the x-axis. Use a calculator after you set up the integral!

1. Squares

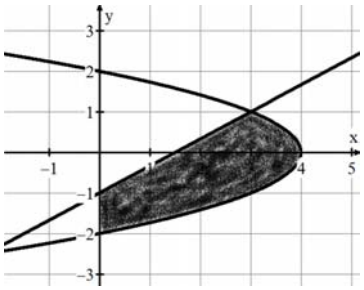
2. Equilateral triangles

3. Semi-circles

4. Isosceles right triangles (side is the base)

5. Set up the integral to find the area of the region bounded by $x = 4 - y^2$, $y = \frac{2}{3}x - 1$, and $x = 0$.
DO NOT EVALUATE.

With respect to *x*.



With respect to *y*.

The base of an object is bounded by the lines $x^2 + y^2 = 100$. Find the volume of the object with the indicated cross sections taken perpendicular to the x-axis. Use a calculator after you set up the integral!

6. Squares

7. Equilateral triangles

8. Semi-circles

9. Isosceles right triangles (hypotenuse = base)

10. The region enclosed by the y-axis, the line $y = 2$, and the curve $y = \sqrt[3]{x}$ is revolved about the y-axis. Set up the integral used to find the volume of the solid that is generated.

The base of an object is bounded by the lines $y = \sqrt{x-1}$, $x = 3$, and $y = 0$. Set up the integral to find the volume of the object with the indicated cross sections taken perpendicular to the y-axis. DO NOT EVALUATE.

11. Squares

12. Equilateral triangles

13. Semi-circles

14. Isosceles right triangles (side is the base)

15. The region in the first quadrant enclosed by the graphs of $y = 2\ln x$, $y = 2$, and $x = 1$ is rotated about the x-axis. What is the integral that represents the volume of the resulting solid of revolution?

11.4 Perpendicular Cross Sections

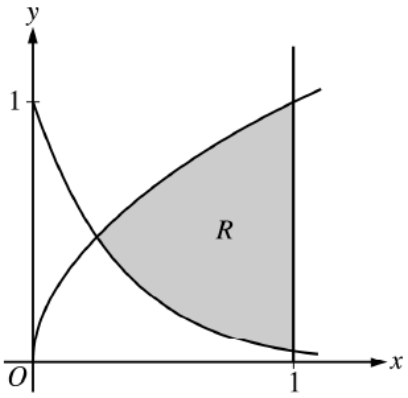
Test Prep

1. What is the area of the region in the first quadrant enclosed by the graphs of $y = \sin x$, $y = 2 - x$, and the x-axis?

(A) 0.552 (B) 0.951 (C) 1.106 (D) 1.600 (E) 2.152

2003 Form A #1 [calculator allowed]

You already did parts (a) and (b) in previous packets. Information needed from parts (a) and (b) is provided.



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.

Point of intersection: $e^{-3x} = \sqrt{x}$ at $(0.238734,\ 0.488604)$

(c) The region R is the base of a solid. For this solid, each cross section perpendicular to the x-axis is a rectangle whose height is 5 times the length of its base in region R. Find the volume of this solid.