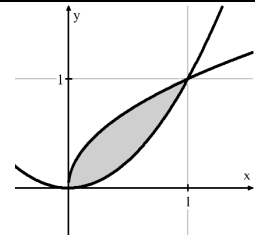


Write your questions and thoughts here!

8.7 Volumes with Cross Sections: Squares and Rectangles

Notes

1. A region is bounded by $y = x^2$ and $y = \sqrt{x}$, and forms the base of a solid. For this solid, each cross section perpendicular to the x -axis is a square. What is the volume of the solid?



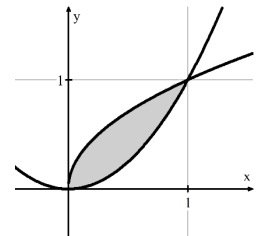
Volume of a Solid with known Cross Sections

$$V =$$

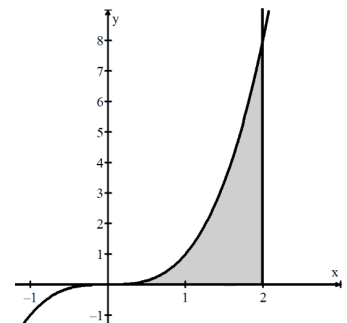
where s is the side length of a cross section perpendicular to the x -axis.

SQUARE cross sections	RECTANGLE cross sections
$V = \int_a^b s^2 dx$ <p>where $s =$</p>	$V = \int_a^b wh dx$ <p>where width =</p> <p>height = given in the problem</p>

2. Same base as #1, but the square cross sections are taken perpendicular to the y -axis.



3. The base of a solid is bounded by $y = x^3$, $y = 0$, and $x = 2$.
 - a. Find the volume if the cross sections, taken perpendicular to the x -axis, form a rectangle whose height is 2 times its width.
 - b. Find the volume if the cross sections, taken perpendicular to the y -axis, form a rectangle whose height is 6.



Write your questions
and thoughts here!

Cross sections when you have no graph.

4. The graphs of $y = x^2 - 4$ and $y = 2x - x^2$ create a bounded area that is the base of a solid. This solid has cross sections that are perpendicular to the x -axis and form squares.

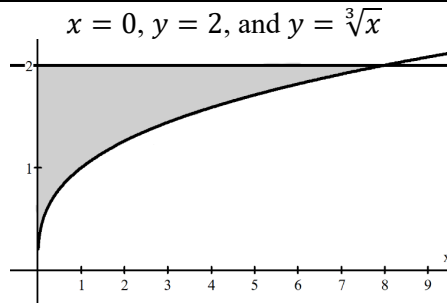
8.7 Volumes with Cross Sections: Squares and Rectangles

Practice

Calculus

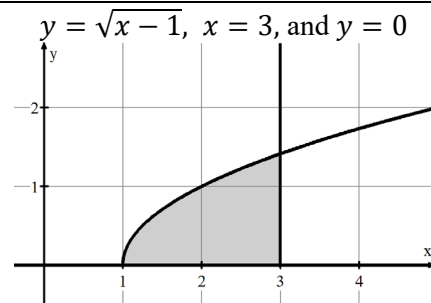
The bounded region shown for each problem represents the base of a solid. Find the volume of each solid based on the given cross sections. Set up the integral(s) first, then use a calculator to evaluate.

1. Square cross sections perpendicular to the x -axis.



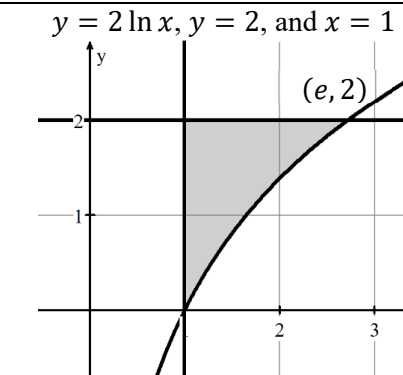
2. Square cross sections perpendicular to the y -axis.

3. Square cross sections perpendicular to the x -axis.



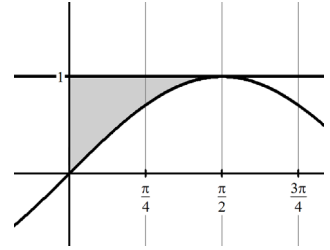
4. Square cross sections perpendicular to the y -axis.

5. Square cross sections perpendicular to the x -axis.

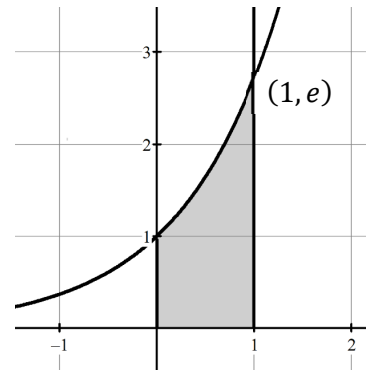


6. Square cross sections perpendicular to the y -axis.

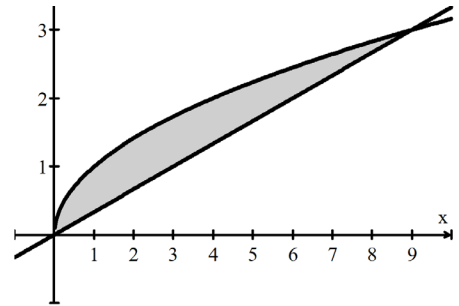
7. The y -axis, $y = \sin x$, and $y = 1$ for $0 \leq x \leq \frac{\pi}{2}$. Each cross section perpendicular to the x -axis is a rectangle whose height is 3 times its width.



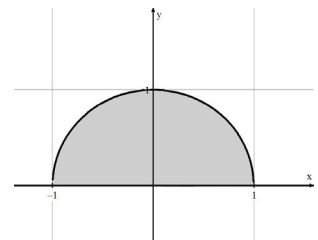
8. The region in the first quadrant bounded by $y = e^x$ and the vertical line $x = 1$. The cross sections perpendicular to the y -axis are rectangles whose height is 2 times their width. Write, but do not evaluate, an expression involving one or more integrals that gives the volume of the solid.



9. $y = \sqrt{x}$ and $y = \frac{x}{3}$ cross sections perpendicular to the y -axis are rectangles whose height is 6.



10. The x -axis and the graph of $y = \sqrt{1 - x^2}$. Each cross section perpendicular to the x -axis is a rectangle whose height is 10 times the width.



The following curves create a bounded region. Each solid has cross sections perpendicular to the x-axis that are squares. Find the volume of each solid based on the given cross sections. Set up the integral(s) first, then use a calculator to evaluate.

11. $y = x - 4$, $y = 4 - x$, and $x = 0$.

12. $x^2 + y^2 = 100$

13. $y = x^2 - 4$, and $y = 4$

No test prep for this lesson because these questions are similar to the free response portion of an AP Exam.