6.2: Volume by cross section

You will be given:

- base (determined by region enclosed by functions)
- geometric shape
- perpendicular to x-axis or y-axis

Perpendicular to the x-axis

$$V = \int_a^b (\text{Area})\,dx$$

in terms of x

Perpedicular to the y-axis

$$V = \int_a^b (\text{Area})\,dy$$

in terms of y

Geometric Shapes

Square

Rectangle

Equilateral triangle

Right Isosceles Triangle(leg on base)

Right Isosceles Triangle (hyp. on base)

Semi-circles

(1) $f(x) = 2\sqrt{x} + 5 \quad [0, 15]$

Cross section perpendicular to the x-axis are squares.

(2) $f(x) = 2\sqrt{x} + 5 \quad [0, 15]$

Cross section perpendicular to the x-axis are semi-circles.

(3) $f(x) = 2\sqrt{x} + 5 \quad [0, 15]$

Cross section perpendicular to the x-axis are rectangles of height 4.

4) Base enclosed by $y = x^2$, $y = 0$, and $x = 2$. Cross sections perpendicular to the x-axis are squares.

5) Base enclosed by $y = x^2$, $y = 0$, and $x = 2$. Cross sections perpendicular to the y-axis are equilateral triangles.

ex: Find the volume of the solid whose base is bounded by $y = \ln x,\ x = e,$ and the $x-$axis with...

a) square cross sections taken perpendicular to thex-axis.

b) equilateral triangular cross sections taken perpendicular to the y-axis.