

Washer Method for Volume

p. 447 - 457 (6.2)

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If the solid revolves around a horizontal axis and is NOT flush up against the axis of rotation, then the volume is found by

$$V = \pi \int_a^b (R^2 - r^2) dx.$$

Revolving about a vertical axis, then the volume is found by

$$V = \pi \int_a^b (R^2 - r^2) dy.$$

Steps for Washer Method

1. Draw region.
2. Determine dx or dy .
3. Find limits.
4. Label big R (farthest away from axis of revolution) and little r (closest to axis of revolution) to set up the integration formula.
5. Integrate and Evaluate.

** (FR, calc.) 1. Find the volume of the solid generated by the graph bounded by $y = x^2$ and the line $y = 4$ when it is revolved about the x -axis.

2. Find the volume of the solid found by revolving $y = \frac{1}{x}$, $x = 2$, and $y = 2$ about the y -axis.

Notes on Area and Volume

1. Find the volume of the solid found by revolving $y = \sqrt{x}$ and $y = x^2$ about the x -axis.
2. Find the area of the region bounded by $x = 3 - y^2$ and $y = x - 1$.
3. Find the volume of the region bounded by $x = 1 - y^2$ and $x = 0$ revolved about the y -axis.
4. Find the volume of the region bounded by $y = e^{-x}$, the x -axis, $x = 0$, and $x = 1$ revolved about the x -axis.
5. Find the volume of the solid that results when $y = x^3$, $x = 1$, and $y = 0$ are revolved about the y -axis.

Notes - Volumes Off The Axes

1. Set up the volume of the region bounded by $y = x$ and $y = x^2$ rotated about the line $y = 3$.
2. Set up the volume of the region bounded by $y = \sqrt{x}$, $y = 0$, and $x = 4$, revolved about the line $x = 6$.
3. Set up the volume of the solid that results when the region bounded by $x = y^2$ and $x = y$ is revolved about the line $y = -1$.
4. Set up the volume of the region bounded by $y = 6 - 2x - x^2$ and $y = x + 6$ revolved about the line $y = 3$. (with calculator)
5. Set up the volume of the region bounded by $xy = 6$, $y = 2$, $y = 6$, $x = 6$ revolved about the line $x = 6$.