Section 6.2: Volume: The Disk Method

A. The Basic Idea

Known Formula	*Representative Element*	*New Integration Formula*

$$V = \pi R^2 w \rightarrow \Delta V = \pi \left[R(x_i) \right]^2 \Delta x \rightarrow V = \pi \int_a^b [R(x)]^2 dx$$

B. The Disk Method: To find the volume of a solid revolution with the disk method, use one of the following

Horizontal Axis:

$$Volume = V = \pi \int_a^b \left[R(x) \right]^2 dx$$

Vertical Axis

$$Volume = V = \pi \int_c^d \left[R(y) \right]^2 dy$$

Example: 4

C. The disk method can be extended to cover solids of revolutions with holes by replacing the representative disk with a representative washer. As a result, there is an outer radius and an inner radius.

Let R(x) = outer radius r(x) = inner radius

$$Volume = V = \pi \int_a^b \left(\left[R(x) \right]^2 - \left[r(x) \right]^2 \right) dx$$

- Integration with respect to y can also be used when needed

Examples: 6, 8, 14, 30

D. Volumes of Solids with Know Cross Sections

1. For cross sections of Area A(x) taken perpendicular to the x-axis, $V = \int_a^b A(x)dx$
2. For cross sections of are A(y) taken perpendicular to the y-axis, $V = \int_c^d A(y)dy$

See Example #6 and #7 in Section 6.2