

# Solids of Revolution

## Washer Method

$h$  = constant offset from axis

$R_o$  = farthest curve from axis of rotation

$R_i$  = closest curve to axis of rotation

Reference rectangle is perpendicular to the axis of revolution.

Limits are units of the axis of revolution.

**Rotating about the x-axis – horizontally**

$$\pi \int_{a_x}^{b_x} ([h - R_o(x)]^2 - [h - R_i(x)]^2) dx$$

**Rotating about the y-axis – vertically**

$$\pi \int_{a_y}^{b_y} ([h - R_o(y)]^2 - [h - R_i(y)]^2) dy$$

## Shell Method

$h$  = constant offset from axis

$R_o$  = farthest curve from axis of rotation

$R_i$  = closest curve to axis of rotation

Reference rectangle is parallel to the axis of revolution.

Limits are units of the axis perpendicular axis of revolution.

**Rotating about the y-axis – vertically**

$$2\pi \int_{a_x}^{b_x} (x - h)[R_o(x) - R_i(x)] dx$$

**Rotating about the x-axis – horizontally**

$$2\pi \int_{a_y}^{b_y} (y - h)[R_o(y) - R_i(y)] dy$$