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### Test 1 Crash Course

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#### Volume - Disc/Washer Method

For HORIZONTAL Axis of Rotation

$$V = \int_{a}^{b} A(x) dx$$

For VERTICAL Axis of Rotation  $V = \int_{c}^{d} A(y) dy$ 

A(x) & A(y) represent cross sectional area of the shape, which is typically a circle, so the the area would be  $\pi r^2$ 

#### STEPS

Step 1) Sketch the curve(s) & determine the region being rotated

Step 2) Label the axis of rotation and choose a formula based on axis orientation

Step 3) Find the integral boundaries

Step 4) Draw a radius line. <u>This is a line **from** the axis of rotation **to** the curve.</u> If there are multiple curves, you will have multiple radii.

Step 5) Determine an equation for the radius (radii) in terms of the variable required Step 6) Setup the integral and solve.

Note: This answer must *always* be positive

#### Example

Find the volume of the solid obtained by rotating  $y = \sqrt{x}$  about the x-axis from 0 to 1.



Note:

The focus of the examples is to learn how to SETUP the integral. We will not focus on solving the actual integral in these videos. On a test however, you must solve the integral using the appropriate integration technique.



**Example** Find the volume of the solid obtained by rotating the area enclosed by  $y = x^2$  and y = 2x about the x - axis. Note: Setup the integral only, do not solve.



**Example** Find the volume of the solid obtained by rotating the area enclosed by  $y = x^2$  and y = 2x about the y - axis. Note: Setup the integral only, do not solve.



**Example** Find the volume of the solid obtained by rotating the area enclosed by  $y = x^2$  and y = 2x about y = -2. Note: Setup the integral only, do not solve.



**Example** Find the volume of the solid obtained by rotating the area enclosed by  $y = x^2$  and y = 2x about the x = 3. Note: Setup the integral only, do not solve.



**Example** Find the volume of the solid obtained by rotating the region enclosed by  $x = y^2$ ,  $x = 1 - y^2$  about x = 3. Note: Setup the integral only, do not solve.



**Example** Find the volume of the solid obtained by rotating the region enclosed by  $y = x^2$ ,  $x = y^2$  about y = 1. Note: Setup the integral only, do not solve.



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