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Test 1 Crash Course

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Volume - Cylindrical Shells Method

For HORIZONTAL Axis of Rotation

$$V = \int_c^d 2\pi RH \, dy$$

For VERTICAL Axis of Rotation

$$V = \int_a^b 2\pi RH \, dx$$

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 line representing H, the height of the cylinder (drawn parallel to axis of rotation)
　　　　 Draw a line representing R, the radius of the cylinder (drawn from axis of rotation to height line)
Step 5) Determine and R and H in terms of the required variable
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.

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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.**

Volume

Example Find the volume of the solid formed when the region enclosed by the lines $y = x, x = 2,$ and $y = 1$ is rotated about the x-axis. **Note: Setup the integral only, do not solve.**
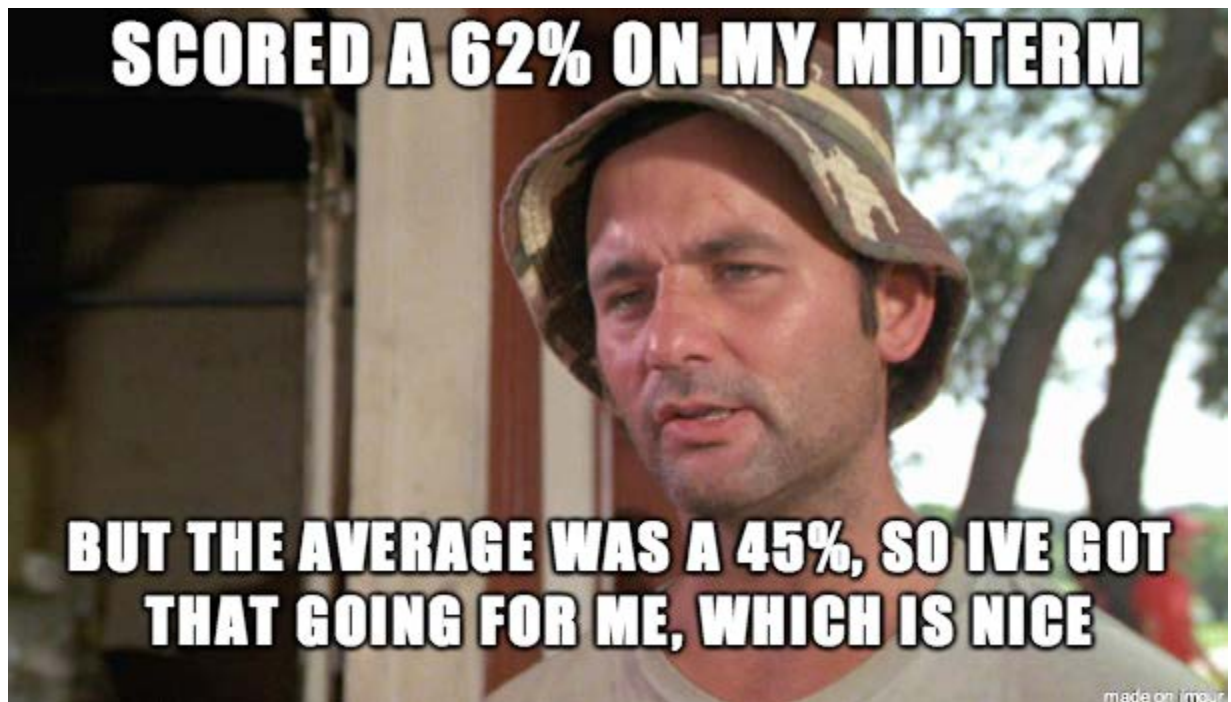
Cylindrical Shells Method

Washer Method

Volume - Cylindrical Shells Method

Reminder: Most of these questions are exactly the same as that of 6.2.
Make sure you go back and see the what the difference in set up is for both methods.

On a test, they rarely, if ever, ask you to use a specific method. You need to know
BOTH methods however, as you can only decide which method you would prefer to
use once you sketch the graph. In many questions, both methods work equally as
well. In other circumstances, one method is much easier than the other method.

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