

Solids of Revolution - Shell Method

Learning Goals

- Compute volumes of solids of revolution using the shell method in the x-direction
- Compute volumes of solids of revolution using the shell method in the y-direction
- Compute volumes of solids of revolution around lines that are not the axes
- Choose the appropriate method for calculating the volume of a given solid of revolution

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1 Another method

There is one more method that can be used for computing the volume of solids of revolution.

Washer Method

What about the other way?

Shell Method

Example: Find the volume of the solid obtained by revolving the region between the graph of $y = x(2 - x)$ and the x axis around the y -axis using the Shell Method.

2 Multiple Functions and Different Lines

The shell method can also be applied to setups where multiple functions or different rotation axes are involved.

Example: Find the volume of the solid of revolution obtained by revolving the region between the y -axis, the graph $y = x^2$, and the graph of $y = 6 - x$ around the line $x = 6$ using the Shell Method.

3 Rotating around Horizontal Lines

The Shell Method also works for rotation around horizontal lines. Based on the way the shells are being added up, this requires an integral in y , as opposed to one in x .

Example: Find the volume of the solid of revolution obtained by rotating the region between $x = 1$, $y = 4$ and $y = x$ around the x axis using the Shell Method.

4 Choosing a Method

There are two ways to compute volumes of solids of revolution. Which one is better depends on the situation.

Example: Find the volume of the solid of revolution obtained by revolving the region between $y = x$ and $y = x^2$ around the line $x = -1$ by both the shell and washer method. Which one is easier?