

Math6100
Day 11 Notes
7.3, Volumes of Solid

7.3 Volumes of Solids

We know about volumes of:

Rectangular Prisms:

Any prism:

Any cylinder:

Any pyramid:

Right Circular Cone:

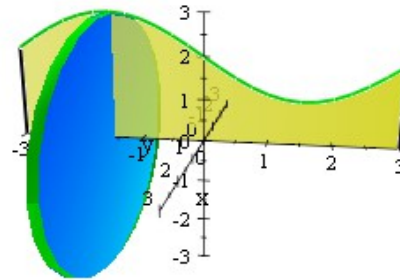
Sphere:

What if we take a closed, bounded 2-d region and revolve it around a horizontal or vertical axis? We'll create a solid and we can find the volume of this solid.

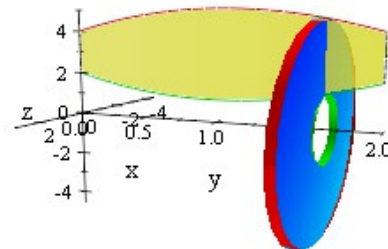
What shape is each cross section of the solid (where I cut out a slice whose little bit of width is perpendicular to the axis of rotation), regardless of how complicated the original region is?

Each of these images showcases one of the three methods for finding volume for solids of revolution. Let's figure them out and find the volume formula.

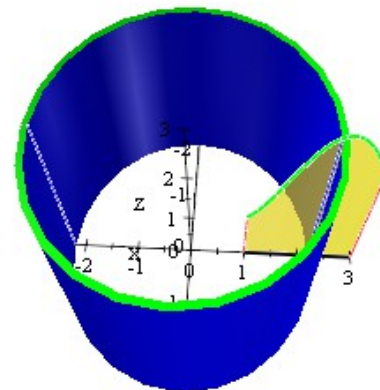
Disk method:



Washer method:



Shell method:



Ex 1: (a) Find the volume of the solid of revolution obtained by revolving the region enclosed by $y = \sqrt{x}$, the x-axis, and the line $x = 9$ about the x-axis. (use disk method)

(b) Can we find the same volume using the shell method for part (a)?

Ex 2: Setup (don't evaluate) the volume integrals for the region enclosed by the given boundary curves, rotated about the stated axis. In each case, you'll have to decide whether to do the disk, washer or shell method.

(a) $x = \frac{2}{y}$, $y = 2$, $y = 6$, $x = 0$ about the y -axis.

(b) $y = 4x$, $y = 4x^2$ about the x -axis.

(c) $y = \frac{3}{16}x^2 + 3$, $y = \frac{1}{16}x^2 + 5$ about the line $y = 2$.

(d) $y=x^3$, $x=1$, $y=0$ about the y-axis.

(e) $y=8-x^2$, $x=0$, $y=0$ (the piece in Quadrant 1)
1. about the x-axis

2. about the y-axis

3. about the line $x = 4$

4. about the line $y = -2$