Math 2300-013: Solids of Revolution

Suggested Steps:

1. Sketch the region and axis about with the region is rotated

2. Decide on dx or dy and draw a tiny rectangle:

3. Sketch a cross-section:

4. Find the change in volume, dV. (Substitute so all of the "pieces" are in x for a dx integral or y for a dy integral.)

5. Use an integral to sum up the volumes of the cross-sections. (Slide the rectangle you drew in Step 2 along to find the limits on your integral.)

Examples:

1. In this example, we will find the volume of the sphere of radius r. Let $\mathcal{R}$ be the region bounded by the semicircle $y = \sqrt{r^2 - x^2}$ and the x-axis. Find the volume of the solid generated by rotating $\mathcal{R}$ around the x-axis.

   Method I: Washers/Disks:

Method II: Shells:

2. Let $\mathcal{R}$ be the region bounded by the curves $y = 2\sin x$ and $y = \tan x$ in the interval $[0, \pi/2)$. Find the volume of the solid formed by rotating $\mathcal{R}$ around

   (a) the line $y = -2$;
   (b) the line $x = -1$.