Math 112
Chapter 6.2: Volumes

The goal of this section is to use integrals to compute volumes. We start by looking at **volumes of revolution**.

$V = \int_a^b A(x)\,dx$ where $A(x)$ is the area of the cross-section at x.

EXAMPLES:

1. An area is bounded by $y = 0$, $y = \sqrt{x}$, and $x = 1$. Find the volume generated by rotating the area around the x-axis.

2. An area is bounded by $y = 0$, $y = \sec x$, $x = -\pi/6$ and $x = \pi/6$. Find the volume generated by rotating the area around the x-axis.

3. An area is bounded by $y = x^3$, $y = 8$, and $x = 0$. Find the volume generated by rotating the area around the y-axis.

4. Find the volume of solid obtained by rotating the the area bounded by $y = x^2 + 1$ and $y = 9 - x^2$ around the x-axis.

5. Find the volume of solid obtained by rotating the the area bounded by $x = y^2 + 1$ and $y = x - 3$ around the y-axis.

6. The volume of a sphere of radius r is $V = \frac{4}{3}\pi r^3$. Derive this formula with an integral.

7. The volume of a cone with a height h and base radius r is $V = \frac{1}{3}\pi r^2 h$. Derive this formula with an integral.