MA 16020 Lesson 12: Volume of solids of revolution I

A **solid of revolution** is:

Goal for today: Compute the volume of solids of revolution via a *disk method*.

The disk method (for rotating about the x-axis).

Idea: Approximate the volume of the solid by thin disks:

Volume of one disk $=$

Volume of the solid $\approx$

As Δx gets smaller and smaller, the approximation gets better and better.

In the limit of this process, Δx becomes $\mathrm{d}x$ and $\sum$ becomes $\int$. So we obtain:

Exercise 1. Compute the volume of the solid obtained by rotating the region enclosed by the curve $y = 3x - x^2$ and the x-axis about the x-axis.

Exercise 2. Compute the volume of the solid obtained by rotating the region enclosed by the lines $x + y = 5, y = 0$ and $x = 0$ about the x-axis.

Exercise 3. Compute the volume of the solid obtained by rotating the region enclosed by the curves $y = \sec(x), y = 0, x = \pi/6$ and $x = \pi/3$ about the x-axis.

Exercise 4. Compute the volume of the solid obtained by rotating the region enclosed by the curves $y = \frac{1}{3}\sqrt{4 - x^2}, y = 0$ and $x = 0$ about the y-axis.