MA 16020 Lesson 13: Volume of solids of revolution II

Last time: Computing volumes of solids of revolution using the disk method.

When can the method be applied?

Goal for today: Compute volumes of more general solids of revolution via a *washer method*.

Example: Compute the volume of the solid obtained by rotating the region enclosed by the curves $y = x^2$ and $y = 3x$ about the x-axis.

The disk method is not applicable.

Idea: Instead of thin disks, we consider thin "washers":

The washer method (for rotating about the x-axis).
Given a region between $y = f(x)$ and $y = g(x)$, $f > g$, over the interval $[a, b]$, the volume is computed as

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

Exercise 2. Compute the volume of the solid obtained by rotating the region inside $x^2 + y^2 = 36$ and to the right of the line $x = 3$ about the y-axis.

Exercise 3. Compute the volume of the solid obtained by rotating the region enclosed by the curves $3y = x^3, x = 0$ and $y = 9$
(a) about the x-axis:

(b) about the y-axis:

Exercise 4. Compute the volume of the solid obtained by rotating the region enclosed by the lines $y = 4x, x = 1, x = 3$ and $y = 0$, about the y-axis.