7.2a Notes and Examples

Name: Block: Seat:

Volumes of Revolutions

Text in Blue Boxes indicate a clickable link
that will open a web page or video if you are connected to internet, like the one below:

Watch this 9 minute video as you complete these notes. (*clicking on the boxed words "9 minute video" on a computer or iPad connected to the internet should take you to to the video*)

Revolving a region around a line forms a solid whose cross-section is a circle.
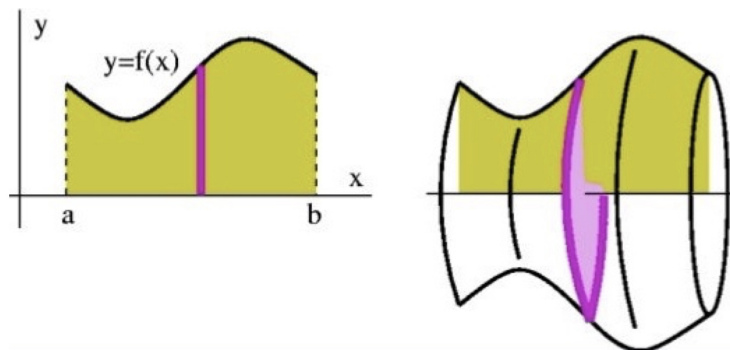
So the Volume is computed based upon πr^2, the area of a circle:

Disk Volume

$$\text{Disk Volume} = \pi \int_a^b [R(x)]^2 \ dx \text{ or } \pi \int_c^d [R(y)]^2 \ dy$$

Washer Volume

$$\text{Washer Volume} = \pi \int_a^b [R(x)]^2 - [r(x)^2] \ dx \text{ or } \pi \int_c^d [R(y)]^2 - [r(y)^2] \ dy$$

1. Intro slides (Chapter 7 Videos at Mathorama Podcast)

   (a) Find the volume of the solid formed by revolving the region bounded by the x-axis, $y = \sqrt{x}$, and $x = 4$ around the the line $y = 0$ (the x-axis) [Minute 1:58 in the video]

   (b) Find the volume of the solid formed by revolving the region bounded by the graphs of $f(x) = 2 - x^2$ and $g(x) = 1$ about the line $y = 1$ [Minute 5:05 in the video]

   (c) Find the volume of the solid formed by revolving the region bounded by the y-axis, $y = \sqrt{x}$ and $y = 2$ about the line $x = 0$ (the y-axis) [Minute 6:35 in the video]

2. The next 3 minute video that accompanies the Delta Math Class 3-17 Examples (7.2a) at `https://deltamath.com` explains part (b). First give part (a) a try on your own.

   (a) Match the shaded region to the solid formed by revolving it around a line (There are six). How many did you get right?

   (b) Let the region R be the area enclosed by the function $f(x) = e^x$, the x-axis and the vertical lines $x = 0$ and $x = 2$. Find the volume of the solid generated when the region R is revolved about the x-axis. You may use a calculator and round to the nearest thousandth.

(c) Let the region R be the area enclosed the function $f(x) = \sqrt{x}$, the horizontal line $y = 1$, and the y-axis. Find the volume of the solid generated when the region R is revolved about the line $y = 1$. You may use a calculator and round to the nearest thousandth.

(d) Let the region R be the area enclosed the function $f(x) = e^x$, and $g(x) = 4x + 1$. Find the volume of the solid generated when the region R is revolved about the x=axis. You may use a calculator and round to the nearest thousandth. Watch Video here

(e) Let the region R be the area enclosed the function $f(x) = \sqrt{2x}$, the horizontal line $y = 2$, and the y-axis. Find the volume of the solid generated when the region R is revolved about the line $y = 5$. You may use a calculator and round to the nearest thousandth.

(f) Find the volume of the solid obtained by rotating the region bounded by $x = 2 - y^2$ and $x = -y$ about the line $x = 7$. Round to the nearest thousandth.