Solids of Revolution

SolidsOfRevolution.tns

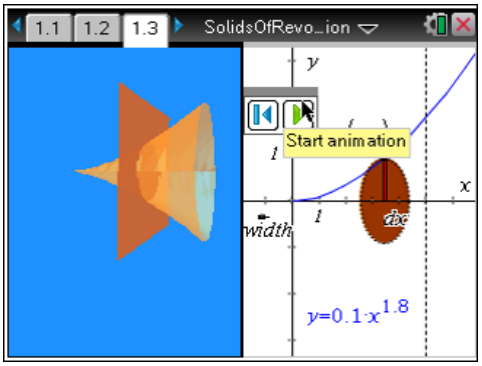
Name _____

Class _____

Goals:

- understand the equation to find the volume
- apply the definite integral to 3D objects formed by rotating a function about an axis

Move to page 1.3.



1. The animation shows the graph of $y = 0.1x^{1.8}$ with the point (x, y) and a thin slice. What is this function rotated about?

Tech Tip: Rotate the shape by pressing [A]. Press [esc] to stop.

Pause the animation. Grab and move point **dx**.

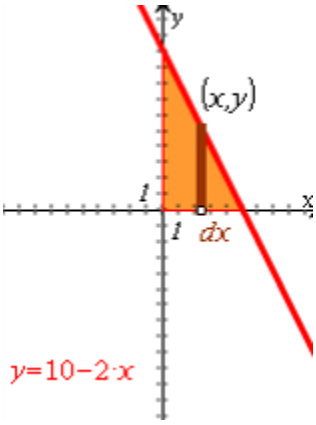
2. **a.** The thin slice helps identify the r in the equation $dV = \pi r^2\, dh$. For the volume on page 1.3, what is the radius r ? ____

Move to page 2.1 to explore $dV = \pi r^2\, dh$. Click and move the **radius** slider. The center of the circle can also be grabbed and moved.

b. Draw a rotated thin slice and identify the parts. Explain the equation for an infinitesimal amount of volume $dV = \pi r^2\, dh$.

Move to page 2.2.

3. **a.** Sketch, in the space at the right, the shape formed by rotating the function about the x-axis.

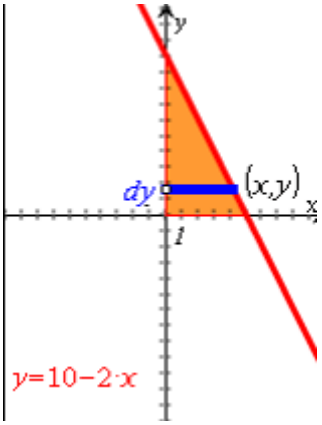


The area bounded by $x = 0$, $y = 0$ and the line $y = 10 – 2x$ is rotated about the x-axis. Find the volume. Show your work.

The volume of cone is $\frac{1}{3}\pi r^2 h$, where r is the radius and h is the height. Show that this agrees with the result you got from using the definite integral.

3. **b.** Sketch, in the space at the right, the shape formed by rotating the function about the *y*-axis.

The area bounded by $x = 0$, $y = 0$, and the line $y = 10 - 2x$ is rotated about the *y*-axis. Find the volume. Show your work.



Show that the volume of a cone, $\frac{1}{3}\pi r^2 h$, agrees with the answer you found using the fundamental theorem of calculus.

4. A **paraboloid** can be formed by rotating the equation _____ about the ___-axis as shown on page 2.7.

Is the radius for this paraboloid, *x* or *y*? ____

Move to page 3.1. What is the volume if the parabola, from $x = 0$ to $x = 2$, is rotated around the *y*-axis? Write the set up for the definite integral and apply the fundamental theorem to show your work.

If the thin slice is ***dy***, the limits of integration will be from $y = a$ to $y = b$. What is the volume of an inscribed cone of height of 4? How does this compare with the volume of the paraboloid you found? Explain. Conjecture what the formula for a paraboloid is.

5. Move to page 4.1. Find the volume to 3 decimal places for $f1(x) = 4\ \sin\left(\frac{x}{2}\right)$ from $x = -5$ to $x = 5$, rotated about the *x*-axis. Show the set up of the definite integral.