6.4: Volume by Shells

Learning Objectives. Upon successful completion of Section 6.4, you will be able to...

- Answer conceptual questions involving the Shell Method.
- Use the shell method to find the volume of the solid of revolution about the y-axis.
- Use the shell method to find the volume of the solid of revolution about the x-axis.
- Use the shell method to find the volume of the solid of revolution about other horizontal and vertical lines (other than the x-axis and y-axis).
- Use both the shell method and washer method to find the volume of the solid of revolution about an indicated axis or line.
- Find the volume of a solid of revolution using any method.
- Solve applications involving the shell method.

Volume by Cylindrical Shells

Motivation for Another Method

Shell Method

✍ **Example.** Let R be the region bounded by $y = e^{-x^2}$, $y = 0$, $x = 0$, and $x = 1$. Find the volume of the solid generated when R is rotated about the y-axis.

✍ **Example.** Let R be the region bounded by $y = x^3$, $y = 8$, and $x = 0$. Find the volume of the solid generated when R is rotated about the x-axis.

✍ **Example.** Let R be the region bounded by $y = x^3$, $x = 2$, and $y = 0$.

(a) Set up the integral(s) needed to find the volume of the solid generated when R is rotated about the line $x = 3$.

(b) Set up the integral(s) needed to find the volume of the solid generated when R is rotated about the line $y = -1$.