Chapter 6. Applications of Definite Integrals

6.2 Volumes by Cylindrical Shells

Note. If we take “$dx$ slices” and revolve them about the $y$-axis, or if we take “$dy$ slices” and revolve them about the $x$-axis, then we generate “cylindrical shells.”

Note. The Shell Formula for Revolution About the $y$-Axis.
The volume of the solid generated by revolving the region between the $x$-axis and the graph of the continuous function $y = f(x) \geq 0, 0 \leq a \leq x \leq b$, about the $y$-axis is

$$V = \int_a^b 2\pi \text{(shell radius)} \text{(shell height)} \, dx = \int_a^b 2\pi x f(x) \, dx.$$  

We can make a similar definition for functions of $y$ and rotation about the $x$-axis.
6.2 Volumes by Cylindrical Shells

Figure 5.2.27, page 388 of 9th Edition

Figure 6.20b, page 441

Note. If we desire to revolve about a horizontal or vertical line other than an axis, then we only need modify the radius term.

Example. Page 445 numbers 28c and 28d.