Chapter 6. Applications of Definite Integrals

6.2 Volumes Using 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

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

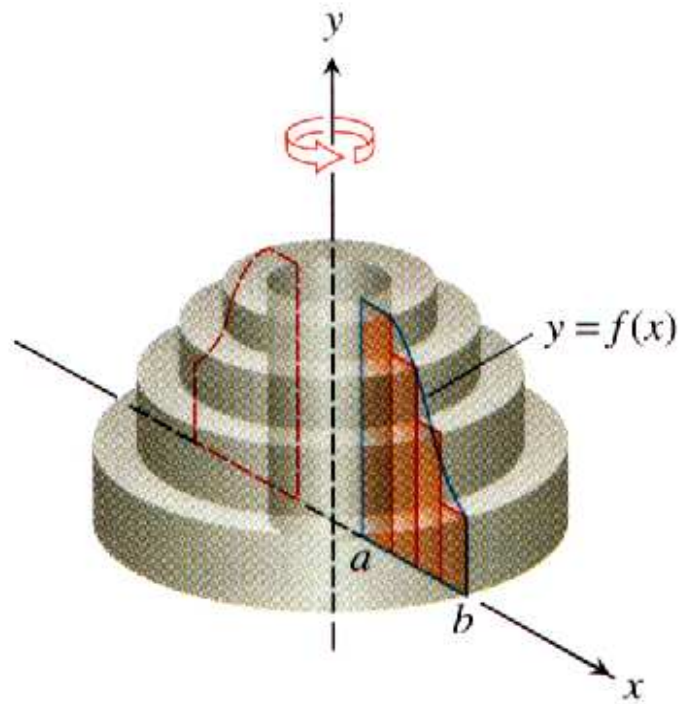We can make a similar definition for functions of y and rotation about the x-axis.
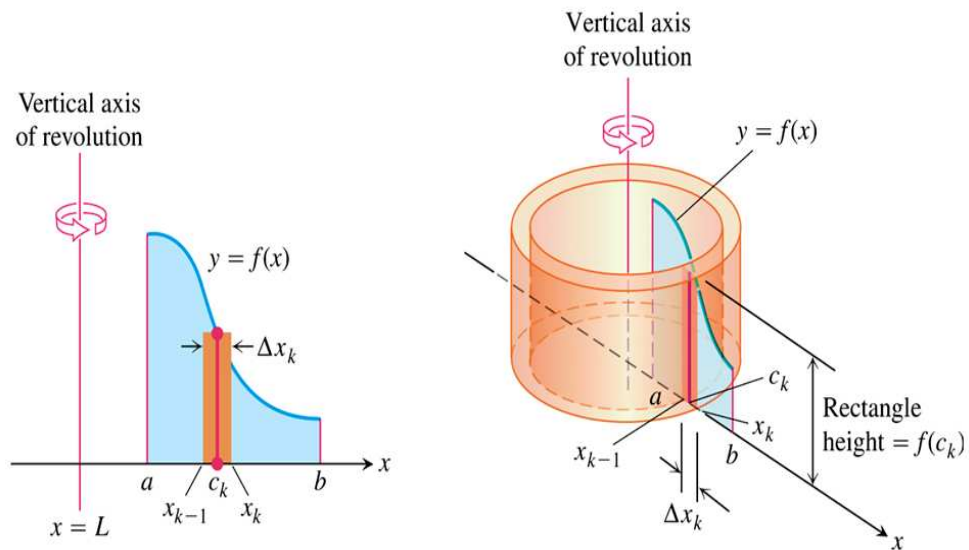
Figure 5.2.27, page 388 of 9th Edition

Figure 6.19, page 376

Example. Page 380 number 28a, page 379 number 6.

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 380 numbers 28c and 28d.