

## 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.

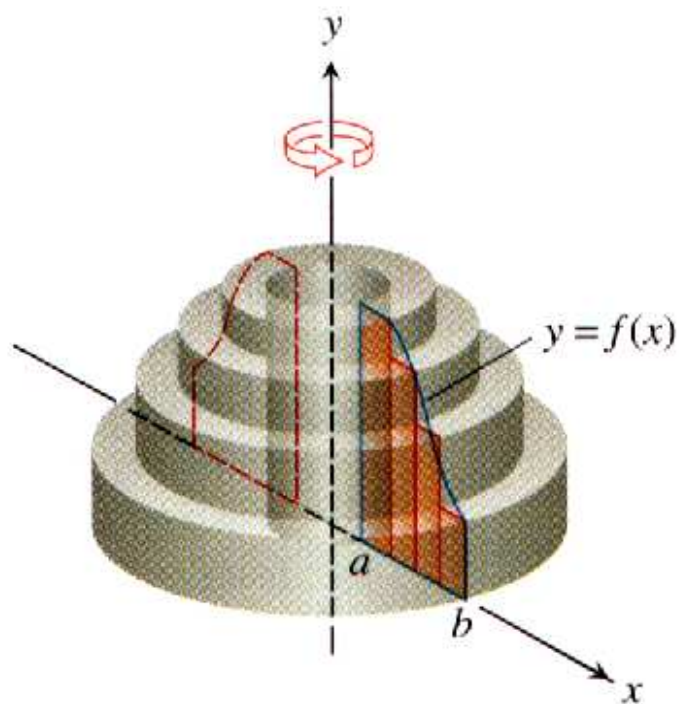


Figure 5.2.27, page 388 of 9th Edition

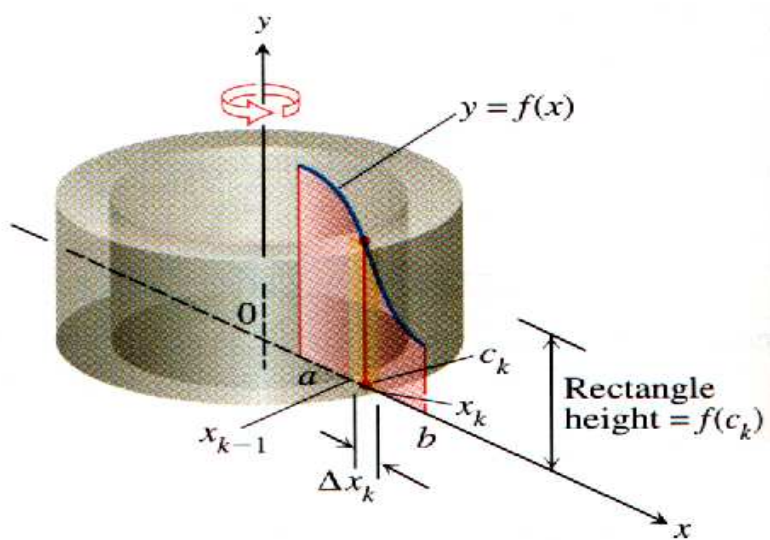


Figure 6.20b, page 441

**Example.** Page 445 number 28a, page 444 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 445 numbers 28c and 28d.