4.2-3 More Volumes

- Recall basic idea of volume computation: integrate the area of the cross section in a direction that is perpendicular to the cross section.

- Particularly important are solids of revolution: solid obtained by rotating a two dimensional region around an axis.

- Depending on how we slice and rotate we can get disks, washers, or shells.

- We’ll do more examples today.

- **Example:** Problem 19, page 293. Suppose you drill a (cylindrical) hole of radius $r$ through a sphere of radius $R$ such that the axis of the hole passes through the center of the sphere. Compute the volume of the remaining ring, and the volume of the material that’s been removed.
• **Example:** Compute the volume of the solid obtained by rotating the ellipse

\[ \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1 \]

around (a) the \( x \)-axis, or, (b) the \( y \)-axis.
**Example**: Problem 29, page 287. Find the volume of the “+” sign formed by two intersecting cylinders, both of length $L$ and radius $r$, as shown in Figure 1.
• Compute the volume of a general cone.