Let \( f(x) \geq 0 \) for \( x \) in \([a, b]\).

Let \( R \) denote the region above the \( x \)-axis and below the graph of \( f(x) \) on the interval \([a, b]\).

Rotate the region \( R \) about the \( x \)-axis.

**GOAL:** Find the volume of the resulting solid.

**EXAMPLE** Find the volume of the solid obtained by rotating the region bounded by the curves \( y = 1 - x^2 \) and \( y = 0 \) about the \( x \)-axis.
EXAMPLES  Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified line.

1. \[ y = \frac{1}{4}x^2, \ y = 5 - x^2; \] about the \( x \)-axis

2. \[ y = \frac{1}{x}, \ y = 0, \ x = 1, \ x = 3; \] about \( y = -1 \)
Another perspective:

EXAMPLES  Find the volume of the solid obtained by rotating the region bounded by the given curves about the specified line.

1.  \( y = \ln x, \ y = 1, \ y = 2, \ x = 0; \) about the \( y \)-axis

2.  \( y = x, \ y = \sqrt{x}; \) about \( x = 2 \)
General version of volume definition: \[ V = \]

**EXAMPLE**  Find the volume of the solid whose base is an elliptical region with boundary curve \[ \frac{x^2}{16} + \frac{y^2}{25} = 1 \] and whose cross-sections that are perpendicular to the \( x \)-axis are isosceles right triangles with hypotenuse in the base.