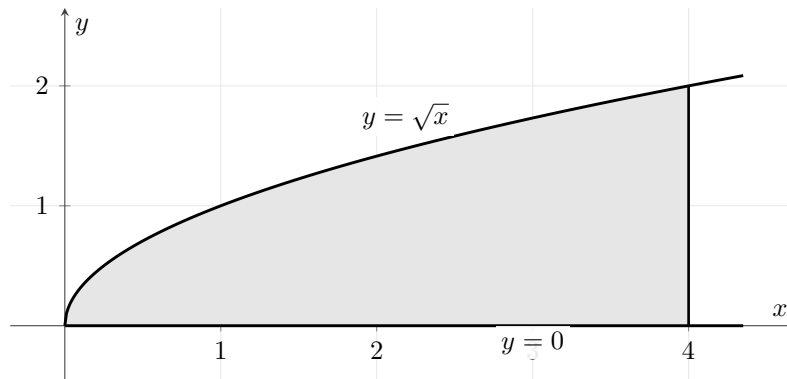


Question 2

The base of a solid is the region bounded by

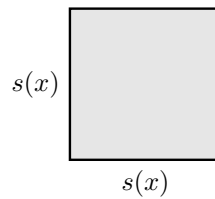
$$y = \sqrt{x} \quad \text{and} \quad y = 0,$$

from $x = 0$ to $x = 4$. Cross-sections perpendicular to the x -axis are squares. Find the volume of the solid.



Shaded base region in the xy -plane.

Cross-section perpendicular to the x -axis



Schematic cross-section; dimensions vary with x .

Question 2 – Solution**1. Choose slices and bounds.**

The cross-sections are perpendicular to the x -axis, so use slices of thickness dx on the given interval $0 \leq x \leq 4$.

2. Find the square side length.

The vertical segment in the base is the side of the square:

$$s(x) = y_{\text{top}} - y_{\text{bottom}} = \sqrt{x} - 0 = \sqrt{x}.$$

3. Write the cross-sectional area.

For a square, area is side squared:

$$A(x) = s(x)^2 = (\sqrt{x})^2 = x.$$

4. Set up and integrate the volume.

Add the areas of the thin cross-sections:

$$V = \int_0^4 A(x) dx = \int_0^4 x dx = \left[\frac{x^2}{2} \right]_0^4.$$

5. Evaluate both bounds.

$$V = \frac{4^2}{2} - \frac{0^2}{2} = \frac{16}{2} - 0 = \boxed{8}.$$

All volumes are in cubic units.