1. A solid is formed over the region in the first quadrant bounded by the curve \( y = \sqrt{10 - x} \) so that the section by any plane perpendicular to the \( x \)-axis is a semicircle. What is the volume of this solid?

2. A solid is formed over the region in the first quadrant bounded by the curve \( y = \sqrt{4 - x} \) so that the section by any plane perpendicular to the \( x \)-axis is a square. What is the volume of this solid?

3. A solid is formed over the region in the first quadrant bounded by the curve \( y = 2x - x^2 \) so that the section by any plane perpendicular to the \( x \)-axis is a semicircle. What is the volume of this solid?

4. The region in the first quadrant bounded by \( y = \sqrt{x^2 - 1}, \ y = 0, \ x = 1, \ x = 4 \) is revolved around the \( x \)-axis. Find the volume of the resulting solid.

5. Find the volume of the solid obtained by rotating about the \( y \)-axis the region bounded by \( y = x^2, \ x = 2 \) and the \( x \)-axis.

6. The region in the first quadrant under the curve \( y^2 = 2x - x^2 \) is rotated about the \( y \)-axis. Find the volume of the resulting solid.

7. The region in the first quadrant bounded by \( y = x^4 \) and \( x = 1 \) is revolved around the \( y \)-axis. Find the volume of the resulting solid.

8. The region in the first quadrant bounded by \( y = x - x^2 \) and \( y = x - x^3 \) is revolved around the \( x \)-axis. Find the volume of the resulting solid.

9. The average value of a function \( y = f(x) \) defined over an interval \([a, b]\) is defined to be

\[
y_{\text{ave}} = \frac{1}{b-a} \int_a^b f(x) \, dx.
\]

(If, for example, the graph of \( y = f(x) \) were a histogram of the grades on an exam, then \( y_{\text{ave}} \) would be the average grade.) Find the average of \( y = \sin x \) over the interval \([0, \pi]\).

10. Let \( g(x) = x^2 + x^3 \) for \( x \) in the interval \( 0 \leq x \leq 10 \). Find the average, or mean, value of \( g \) on the interval. Find the average slope of the graph of \( y = g(x) \) on the interval.