

AP Calculus  
Worksheet–Volume

Directions: Complete the following on a separate sheet of paper. (Hint: Sketch the graph, determine the bounds, and determine whether you should use disc, washer, or shell.)

- 1) The equations  $y = x^2$ ,  $y = 0$ , and  $x = 2$  define the bounds of a plane region. Find the volume of the solid obtained by rotating the region about the  $x$ -axis.
- 2) The region in the first quadrant bounded by the graph of  $y = \sec x$ ,  $x = \frac{\pi}{4}$ , and the axes is rotated about the  $x$ -axis. What is the volume of the solid generated?
- 3) Find the volume of the solid formed by revolving the region bounded by the graphs of  $y = x + 1$ ,  $y = x^3 + 1$ ,  $x = 0$ , and  $x = 1$  about the  $x$ -axis.
- 4) The equations  $y = \sqrt{4 + x}$ ,  $x = 0$ , and  $y = 0$  define the bounds of a plane region. Find the volume of the solid obtained by rotating the region about the  $x$ -axis.
- 5) The region in the first quadrant between the  $x$ -axis and the graph of  $y = 6x - x^2$  is rotated around the  $y$ -axis. What is the volume of the resulting solid of revolution?
- 6) The equations  $y = \frac{1}{(x-1)^3}$ ,  $x = -1$ ,  $x = 0$ , and  $y = 0$  define the bounds of a plane region. Find the volume of the solid obtained by rotating the region about the  $x$ -axis.
- 7) Find the volume of the solid formed by revolving the region bounded by the graphs of  $y = x$  and  $y = 3x - x^2$  about the  $y$ -axis.
- 8) The equations  $y = \frac{1}{x}$ ,  $x = 1$ ,  $x = 3$ , and  $y = 0$  define the bounds of a plane region. Find the volume of the solid obtained by rotating the region about the  $y$ -axis.
- 9) Find the volume of the solid formed by revolving the region bounded by the graphs of  $y = 3x^2$  and  $y = 2x + 1$  about the  $x$ -axis.

## Worksheet Answers

(1)  $\frac{32}{5}\pi$

(2)  $\pi$

(3)  $\frac{29}{42}\pi$

(4)  $8\pi$

(5)  $216\pi$

(6)  $\frac{31}{160}\pi$

(7)  $\frac{8}{3}\pi$

(8)  $4\pi$

(9)  $\frac{1088}{405}\pi$