Review Exercises

See CalcChat.com for tutorial help and worked-out solutions to odd-numbered exercises.

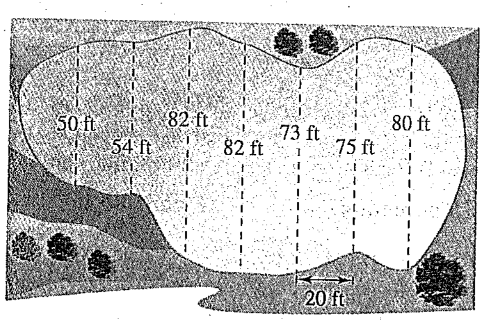
Finding the Area of a Region In Exercises 1–10, sketch the region bounded by the graphs of the equations and find the area of the region.

1. $y = 6 - \frac{1}{2}x^2, \quad y = \frac{3}{4}x, \quad x = -2, \quad x = 2$
2. $y = \frac{1}{x^2}, \quad y = 4, \quad x = 5$
3. $y = \frac{1}{x^2 + 1}, \quad y = 0, \quad x = -1, \quad x = 1$
4. $x = y^2 - 2y, \quad x = -1, \quad y = 0$
5. $y = x, \quad y = x^3$
6. $x = y^2 + 1, \quad x = y + 3$
7. $y = e^x, \quad y = e^2, \quad x = 0$
8. $y = \csc x, \quad y = 2, \quad \frac{\pi}{6} \le x \le \frac{5\pi}{6}$
9. $y = \sin x, \quad y = \cos x, \quad \frac{\pi}{4} \le x \le \frac{5\pi}{4}$
10. $x = \cos y, \quad x = \frac{1}{2}, \quad \frac{\pi}{3} \le y \le \frac{7\pi}{3}$

Finding the Area of a Region In Exercises 11–14, use a graphing utility to graph the region bounded by the graphs of the equations, and use the integration capabilities of the graphing utility to find the area of the region.

11. $y = x^2 - 8x + 3, \ y = 3 + 8x - x^2$
12. $y = x^2 - 4x + 3, \ y = x^3, \ x = 0$
13. $\sqrt{x} + \sqrt{y} = 1, \ y = 0, \ x = 0$
14. $y = x^4 - 2x^2, \ y = 2x^2$

15. **Numerical Integration** Estimate the surface area of the pond using (a) the Trapezoidal Rule and (b) Simpson's Rule.



16. **Revenue** The models $R_1 = 6.4 + 0.2t + 0.01t^2$ and $R_2 = 8.4 + 0.35t$ give the revenue (in billions of dollars) for a large corporation. Both models are estimates of the revenues from 2015 through 2020, with $t = 15$ corresponding to 2015. Which model projects the greater revenue? How much more total revenue does that model project over the six-year period?

Finding the Volume of a Solid In Exercises 17–22, use the disk method *or* the shell method to find the volumes of the solids generated by revolving the region bounded by the graphs of the equations about the given line(s).

17. $y = x, \quad y = 0, \quad x = 3$
    (a) the x-axis (b) the y-axis
    (c) the line $x = 3$ (d) the line $x = 6$
18. $y = \sqrt{x}, \quad y = 2, \quad x = 0$
    (a) the x-axis (b) the line $y = 2$
    (c) the y-axis (d) the line $x = -1$
19. $y = \frac{1}{x^4 + 1}, \quad y = 0, \quad x = 0, \quad x = 1$
    revolved about the y-axis
20. $y = \frac{1}{\sqrt{1 + x^2}}, \quad y = 0, \quad x = -1, \quad x = 1$
    revolved about the x-axis
21. $y = \frac{1}{x^2}, \quad y = 0, \quad x = 2, \quad x = 5$
    revolved about the y-axis
22. $y = e^{-x}, \quad y = 0, \quad x = 0, \quad x = 1$
    revolved about the x-axis

23. **Depth of Gasoline in a Tank** A gasoline tank is an oblate spheroid generated by revolving the region bounded by the graph of

$$\frac{x^2}{16} + \frac{y^2}{9} = 1$$

about the y-axis, where x and y are measured in feet. Find the depth of the gasoline in the tank when it is filled to one-fourth its capacity.

24. **Using Cross Sections** Find the volume of the solid whose base is bounded by the circle $x^2 + y^2 = 9$ and the cross sections perpendicular to the x-axis are equilateral triangles.

Finding Arc Length In Exercises 25 and 26, find the arc length of the graph of the function over the indicated interval.

25. $f(x) = \frac{4}{5}x^{5/4}, \quad [0, 4]$
26. $y = \frac{1}{6}x^3 + \frac{1}{2x}, \quad [1, 3]$

27. **Length of a Catenary** A cable of a suspension bridge forms a catenary modeled by the equation

$$y = 300 \cosh\left(\frac{x}{2000}\right) - 280, \quad -2000 \le x \le 2000$$

where x and y are measured in feet. Use the integration capabilities of a graphing utility to approximate the length of the cable.