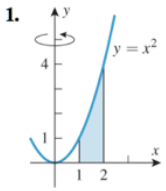
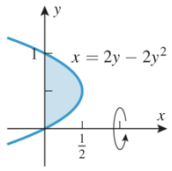
Sections 6.3 & 6.4: Shell Method & Length of a Plane Curve

Use cylindrical shells to find the volume of the solid generated when the shaded region is revolved about the indicated axis.

1. 

3. 

Use cylindrical shells to find the volume of the solid generated when the region enclosed by given curves is revolved about the *y*-axis.

5. $y = x^3, x = 1, y = 0$
8. $y = \cos(x^2), x = 0, x = \frac{1}{2}\sqrt{\pi}, y = 0$
9. $y = 2x - 1, y = -2x + 3, x = 2$
12. $y = e^{x^2}, x = 1, x = \sqrt{3}, y = 0$

Use cylindrical shells to find the volume of the solid generated when the region enclosed by the given curves is revolved about the *x*-axis.

13. $y^2 = x, y = 1, x = 0$
15. $y = x^2, x = 1, y = 0$

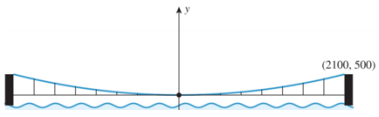
21. Use a CAS to find the volume of the solid generated when the region enclosed by $y = e^x$ and $y = 0$ for $1 \leq x \leq 2$ is revolved about the y-axis.

Find the exact arc length of the curve over the interval.

3. $y = 3x^{3/2} - 1$ from $x = 0$ to $x = 1$
5. $y = x^{2/3}$ from $x = 1$ to $x = 8$
7. $24xy = y^4 + 48$ from $y = 2$ to $y = 4$

15. Consider the curve $y = x^{2/3}$.
    a. Sketch the portion of the curve between $x = -1$ and $x = 8$.
    b. Explain why the formula $L = \int_a^b \sqrt{1 - [f'(x)]^2}dx$ cannot be used to find the arc length of the curve sketched in part (a).
    c. Find the arc length of the curve sketched in part (a).

23. The central span of the Golden Gate Bridge in California is 4200 ft long and is suspended from cables that rise 500 ft above the roadway on either side. Approximately how long is the portion of a cable that lies between the support towers on one side of the roadway? [Hint: As suggested by the accompanying figure, assume the cable is modeled by a parabola $y = ax^2$ that passes through the point (2100, 500). Use a CAS or graphing utility with a numerical integration capability to approximate the length of the cable. Round to 3-decimal places.]



25. A golfer makes a successful chip shot to the green. Suppose that the path of the ball from the moment it is struck to the moment it hits the green is described by $y = 12.54x - 0.41x^2$ where *x* is the horizontal distance (in yards) from the point where the ball is struck, and *y* is the vertical distance above the fairway. Find the distance of the path of the golf ball.