

1. Find the area of the region bounded by  $y = e^x$ ,  $y = e^{-x}$ ,  $x = -2$ , and  $x = 1$ .
2. Find the volume of the solid obtained by rotating the region bounded by  $y = x^2 - 1$ ,  $y = 0$ ,  $x = 1$ ,  $x = 2$  about the  $x$ -axis.
3. Find the volume of the solid obtained by rotating the region bounded by  $y = x^2$ ,  $y = 0$ ,  $x = 1$ ,  $x = 2$  about
  - (a) the  $y$ -axis
  - (b)  $x = 4$
4. The base of solid  $S$  is the triangular region with vertices  $(0,0)$ ,  $(2,0)$ , and  $(0,1)$ . Cross-sections perpendicular to the  $x$ -axis are semicircles. Find the volume of  $S$ .
5. A heavy rope, 50 ft long, weighs 0.5 lb/ft and hangs over the edge of a building 120 ft high. How much work is done in pulling the half rope to the top of the building?
6. A spring has a natural length of 20 cm. If a 25-N force is required to keep it stretched to a length of 30 cm, how much work is required to stretch it from 20 cm to 25 cm?
7. A tank in a shape of a sphere of radius 9 m is half full of water. Find the work  $W$  required to pump the water out of the spout, if the height of the spout is 3 m.
8. Find the average value of  $f(x) = \sin^2 x \cos x$  on  $[-\pi/2, \pi/4]$ .
9. Evaluate the integral

(a)  $\int t^2 \cos(1 - t^3) dt$

(b)  $\int \frac{x^2}{\sqrt{1-x}} dx$

(c)  $\int x^3 \sqrt{x^2 + 5} dx$

(d)  $\int \frac{\sin^3 x}{\sec^4 x} dx$

(e)  $\int x^3 e^{x^2} dx$

(f)  $\int_0^{\pi/8} \sin^2(2x) \cos^3(2x) dx$

(g)  $\int \sin^2 x \cos^4 x dx$

(h)  $\int_0^{\pi/4} \tan^4 x \sec^2 x dx$

(i)  $\int \tan x \sec^3 x dx$

(j)  $\int \sin 3x \cos x dx$