

1. Find the volume of the solid generated by revolving the region bounded by  $y = (x - 3)^2$  and the coordinate axes about the  $x$ -axis.
2. Find the volume of the solid generated when the region bounded by  $y = x$  and  $y = 2 \sin x$  is revolved about the  $x$ -axis.
3. Find the volume of the solid generated when the region bounded by the  $x$ -axis,  $x = 0$ , the line  $x = \pi$ , and the curve  $y = \cos(\cos x)$  is revolved about the  $x$ -axis.
4. Find the volume of the solid generated when the region in the first quadrant bounded by  $x = 0$ ,  $y = 2$ , and  $y = e^x$  is revolved about the  $x$ -axis.
5. Find the volume of the solid whose base is bounded by  $x + 2y = 4$  and the coordinate axes and whose cross sections taken perpendicular to the  $x$ -axis is a semicircle.
6. Find the volume of the solid whose base is bounded by  $x^2 + y^2 = 9$  and whose cross sections taken perpendicular to the  $x$ -axis are equilateral triangles.
7. Find the volume of the solid whose base is bounded by  $y = 3(x - 2)^2$  and the coordinate axes and whose cross sections taken perpendicular to the  $x$ -axis are squares.
8. Find the volume of the solid whose base is bounded by  $4x^2 + y^2 = 1$  and whose cross sections taken perpendicular to the  $x$ -axis are semicircles.
9. Find the average value of  $f(x) = \cos \frac{1}{2}x$  on  $[-4, 0]$ .
10. Let  $R(t)$  represent the rate at which water is leaking out of a tank in gallons per hour. Write an integral expression which would describe the total amount of water that leaks out in the first 3 hours.
11. A tank is being filled with water at the rate of  $300\sqrt{t}$  gallons per hour with  $t > 0$  measured in hours. If the tank is initially empty, how many gallons of water are in the tank after 4 hours?
12. For a car traveling at a speed of  $s$  miles per hour, the fuel consumption of the car,  $C(s)$ , is measured in gallons per mile. What are the units of  $\int_a^b C(s) ds$ ?
13. A particle moves along a straight line so that its velocity is given by  $v(t) = t^2$ . How far does the car travel between  $t = 1$  and  $t = 3$ ?
14. The average value of a continuous function  $f(x)$  on the closed interval  $[3, 7]$  is 12. What is the value of  $\int_3^7 f(x) dx$ ?
15. A particle with velocity at any time  $t$  given by  $v(t) = 2e^{2t}$  moves in a straight line. How far does the particle travel during the time interval when its velocity increases from 2 to 4?
16. Find the average value of  $f(x) = e^{-x} \sin x$  on  $[1, \pi]$ .
17. Find the area of the region bounded by  $y = x^2 + 1$ ,  $y = 5$  and to the right of  $x = 0$ .
18. Find the area of the region bounded by  $y = e^{x^2} - 2$  and  $y = \sqrt{4 - x^2}$ .
19. Find the area of the region bounded by  $y = 3x^2 + 2x$ ,  $x = 1$ ,  $x = 3$  and the  $x$ -axis.
20. Find the total area enclosed by the graphs of  $y = x^3$  and  $y = x$ .
21. Find the area of the region bounded by  $y = x^2$  and  $y = \frac{2}{x^2 + 1}$ .
22. Find the area of the region bounded by  $y = x\sqrt{1 - x^2}$  and  $y = x - x^3$ .

1.  $\frac{243\pi}{5}$
2. 6.678
3. 6.040
4. 3.998
5.  $\frac{2\pi}{3}$
6.  $36\sqrt{3}$
7. 57.600
8.  $\frac{\pi}{3}$
9.  $\frac{1}{2} \sin 2$
10.  $\int_0^3 R(t) dt$
11. 1600 gallons
12. gallons per hour
13.  $\frac{26}{3}$
14. 48
15. 1
16. 0.129
17.  $\frac{16}{3}$
18. 5.050
19. 34
20.  $\frac{1}{2}$
21. 2.475
22.  $\frac{1}{6}$