STEWART 5.3

1. If $w'(t)$ is the rate of growth of a child in pounds per year, what does $\int_5^{10} w'(t)\,dt$ represent?

2. The current in a wire is defined as the derivative of the charge: $I(t) = Q'(t)$. (See Example 3 in Section 3.3.) What does $\int_a^b I(t)\,dt$ represent?

3. If oil leaks from a tank at a rate of $r(t)$ gallons per minute at time t, what does $\int_0^{120} r(t)\,dt$ represent?

4. A honeybee population starts with 100 bees and increases at a rate of $n'(t)$ bees per week. What does $100 + \int_0^{15} n'(t)\,dt$ represent?

5. In Section 4.7 we defined the marginal revenue function $R'(x)$ as the derivative of the revenue function $R(x)$, where x is the number of units sold. What does $\int_{1000}^{5000} R'(x)\,dx$ represent?

6. If $f(x)$ is the slope of a trail at a distance of x miles from the start of the trail, what does $\int_3^5 f(x)\,dx$ represent?

7. If x is measured in meters and $f(x)$ is measured in newtons, what are the units for $\int_0^{100} f(x)\,dx$?

8. If the units for x are feet and the units for $a(x)$ are pounds per foot, what are the units for da/dx? What units does $\int_2^8 a(x)\,dx$ have?

9–34 ■ Evaluate the integral.

9. $\int_{-1}^{3} x^5\,dx$

10. $\int_1^2 x^{-2}\,dx$

11. $\int_2^8 (4x + 3)\,dx$

12. $\int_0^4 (1 + 3y - y^2)\,dy$

13. $\int_0^4 \sqrt{x}\,dx$

14. $\int_\pi^{2\pi} \cos\theta\,d\theta$

15. $\int_{-1}^{0} (2x - e^x)\,dx$

16. $\int_0^1 x^{3/7}\,dx$

17. $\int_1^2 \frac{3}{t^4}\,dt$

18. $\int_1^4 \frac{1}{\sqrt{x}}\,dx$

19. $\int_1^2 \frac{x^2 + 1}{\sqrt{x}}\,dx$

20. $\int_0^2 (x^3 - 1)^2\,dx$

21. $\int_{\pi/4}^{\pi/3} \sin t\,dt$

22. $\int_1^2 \frac{4 + u^2}{u^3}\,du$

23. $\int_0^1 u(\sqrt{u} + \sqrt[3]{u})\,du$

24. $\int_0^5 (2e^x + 4\cos x)\,dx$

25. $\int_{\pi/6}^{\pi/3} \csc^2\theta\,d\theta$

26. $\int_1^8 \frac{x - 1}{\sqrt[3]{x^2}}\,dx$

27. $\int_1^9 \frac{1}{2x}\,dx$

28. $\int_{\ln 3}^{\ln 6} 8e^x\,dx$

29. $\int_8^9 2^t\,dt$

30. $\int_{\pi/3}^{\pi/2} \csc x \cot x\,dx$

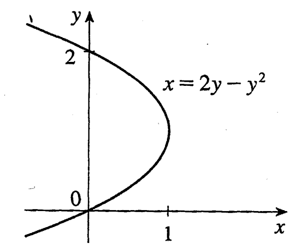
31. $\int_1^{\sqrt{3}} \frac{6}{1 + x^2}\,dx$

32. $\int_0^{0.5} \frac{dx}{\sqrt{1 - x^2}}$

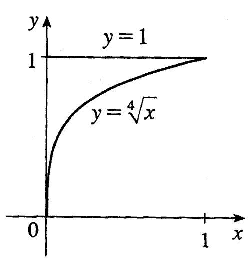
33. $\int_0^{\pi/4} \frac{1 + \cos^2\theta}{\cos^2\theta}\,d\theta$

34. $\int_{-1}^{2} |x - x^2|\,dx$

49. The area of the region that lies to the right of the y-axis and to the left of the parabola $x = 2y - y^2$ (the shaded region in the figure) is given by the integral $\int_0^2 (2y - y^2)\,dy$. (Turn your head clockwise and think of the region as lying below the curve $x = 2y - y^2$ from $y = 0$ to $y = 2$.) Find the area of the region.



50. The boundaries of the shaded region are the y-axis, the line $y = 1$, and the curve $y = \sqrt[4]{x}$. Find the area of this region by writing x as a function of y and integrating with respect to y (as in Exercise 49).



51–52 ■ The velocity function (in meters per second) is given for a particle moving along a line. Find (a) the displacement and (b) the distance traveled by the particle during the given time interval.

51. $v(t) = 3t - 5,\quad 0 \leqslant t \leqslant 3$

52. $v(t) = t^2 - 2t - 8,\quad 1 \leqslant t \leqslant 6$

55. The linear density of a rod of length 4 m is given by $\rho(x) = 9 + 2\sqrt{x}$ measured in kilograms per meter, where x is measured in meters from one end of the rod. Find the total mass of the rod.

56. An animal population is increasing at a rate of $200 + 50t$ per year (where t is measured in years). By how much does the animal population increase between the fourth and tenth years?