EXERCISES 4.9

1–16 ■ Find the most general antiderivative of the function. (Check your answer by differentiation.)

1. $f(x) = 12x^2 + 6x - 5$

2. $f(x) = x^3 - 4x^2 + 17$

3. $f(x) = 6x^9 - 4x^7 + 3x^2 + 1$

4. $f(x) = x^{99} - 2x^{49} - 1$

5. $f(x) = \sqrt{x} + \sqrt[3]{x}$

6. $f(x) = \sqrt[3]{x^2} - \sqrt{x^3}$

7. $f(x) = 6/x^5$

8. $f(x) = \dfrac{3}{x^2} - \dfrac{5}{x^4}$

9. $g(t) = (t^3 + 2t^2)/\sqrt{t}$

10. $f(x) = x^{2/3} + 2x^{-1/3}$

11. $h(x) = \sin x - 2\cos x$

12. $f(t) = \sin t - 2\sqrt{t}$

13. $f(t) = \sec^2 t + t^2$

14. $f(\theta) = \theta + \sec\theta\tan\theta$

15. $f(x) = 2x + 5(1 - x^2)^{-1/2}$

16. $f(x) = \dfrac{x^2 + x + 1}{x}$

17–40 ■ Find $f(x)$.

17. $f''(x) = x^2 + x^3$

18. $f''(x) = 60x^4 - 45x^2$

19. $f''(x) = 1$

20. $f''(x) = \sin x$

21. $f'''(x) = 24x$

22. $f'''(x) = \sqrt{x}$

23. $f'(x) = 4x + 3, \quad f(0) = -9$

24. $f'(x) = 12x^2 - 24x + 1, \quad f(1) = -2$

25. $f'(x) = 3\sqrt{x} - 1/\sqrt{x}, \quad f(1) = 2$

26. $f'(x) = 1 + 1/x^2, \ x > 0, \quad f(1) = 1$

27. $f'(x) = 3\cos x + 5\sin x, \quad f(0) = 4$

28. $f'(x) = 3x^{-2}, \quad f(1) = f(-1) = 0$

29. $f'(x) = 2/x, \quad x < 0, \quad f(-1) = 7$

30. $f'(x) = 4 - 3(1 + x^2)^{-1}, \quad f(1) = 0$

31. $f''(x) = x, \quad f(0) = -3, \quad f'(0) = 2$

32. $f''(x) = 20x^3 - 10, \quad f(1) = 1, \quad f'(1) = -5$

33. $f''(x) = x^2 + 3\cos x, \quad f(0) = 2, \quad f'(0) = 3$

34. $f''(x) = x + \sqrt{x}, \quad f(1) = 1, \quad f'(1) = 2$

35. $f''(x) = 6x + 6, \quad f(0) = 4, \quad f(1) = 3$

36. $f''(x) = 12x^2 - 6x + 2, \quad f(0) = 1, \quad f(2) = 11$

37. $f''(x) = 1/x^3, \quad x > 0, \quad f(1) = 0, \quad f(2) = 0$

38. $f''(x) = 3e^x + 5\sin x, \quad f(0) = 1, \quad f'(0) = 2$

39. $f''(x) = x^{-2}, \quad x > 0, \quad f(1) = 0, \quad f(2) = 0$

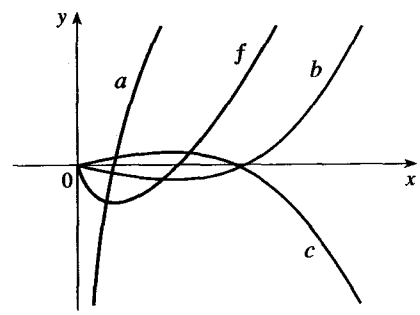
40. $f'''(x) = \sin x, \quad f(0) = 1, \quad f'(0) = 1, \quad f''(0) = 1$

41. Given that the graph of f passes through the point $(1, 6)$ and that the slope of its tangent line at $(x, f(x))$ is $2x + 1$, find $f(2)$.

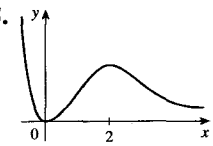
42. Find a function f such that $f'(x) = x^3$ and the line $x + y = 0$ is tangent to the graph of f.

43–44 ■ The graph of a function f is shown. Which graph is an antiderivative of f and why?

43.



17. $(x^4/12) + (x^5/20) + Cx + D$ **19.** $(x^2/2) + Cx + D$
21. $x^4 + (Cx^2/2) + Dx + E$ **23.** $2x^2 + 3x - 9$
25. $2x^{3/2} - 2\sqrt{x} + 2$ **27.** $3\sin x - 5\cos x + 9$
29. $2\ln|x| + 7$ **31.** $(x^3/6) + 2x - 3$
33. $(x^4/12) - 3\cos x + 3x + 5$ **35.** $x^3 + 3x^2 - 5x + 4$
37. $f(x) = 1/(2x) + (x/4) - (3/4)$
39. $f(x) = -\ln x + (\ln 2)x - \ln 2$
41. 10 **43.** b
45.



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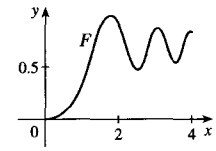

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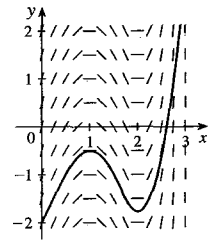

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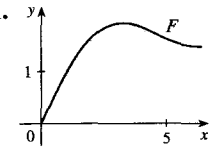
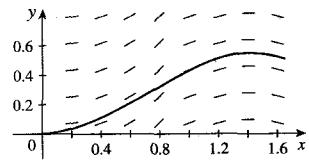


53.



55. $s(t) = 3t - t^2 + 4$
57. $s(t) = (t^3/2) + 4t^2 - 2t + 1$
59. $s(t) = (t^4/12) - (t^3/6) - 10t$
61. (a) $s(t) = 450 - 4.9t^2$ (b) $\sqrt{450/4.9} \approx 9.58$ s
(c) $-9.8\sqrt{450/4.9} \approx -93.9$ m/s
63. (a) $s(t) = 450 + 5t - 4.9t^2$
(b) $(5 + \sqrt{8845})/9.8 \approx 10.1$ s (c) ≈ -94.0 m/s
67. \$742.08 **69.** $\frac{130}{11} \approx 11.8$ s **71.** $\frac{88}{15}$ ft/s^2
73. 225 ft

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1. $4x^3 + 3x^2 - 5x + C$ **3.** $(3x^{10}/5) - (x^8/2) + x^3 + x + C$
5. $(2x^{3/2}/3) + (3x^{4/3}/4) + C$
7. $-3/(2x^4) + C_1$ if $x > 0$, $-3/(2x^4) + C_2$ if $x < 0$
9. $(2t^{7/2}/7) + (4t^{5/2}/5) + C$
11. $-\cos x - 2\sin x + C$
13. $\tan t + (t^3/3) + C_n$, $(2n - 1)\pi/2 < t < (2n + 1)\pi/2$
15. $x^2 + 5\sin^{-1}x + C$