EXERCISES 5.5

1–6 ■ Evaluate the integral by making the given substitution.

1. $\int x(x^2 - 1)^{99}\,dx, \quad u = x^2 - 1$

2. $\int \frac{x^2}{\sqrt{2 + x^3}}\,dx, \quad u = 2 + x^3$

3. $\int \sin 4x\,dx, \quad u = 4x$

4. $\int \frac{dx}{(2x + 1)^2}, \quad u = 2x + 1$

5. $\int \frac{x + 3}{(x^2 + 6x)^2}\,dx, \quad u = x^2 + 6x$

6. $\int \sec a\theta \tan a\theta\,d\theta, \quad u = a\theta$

7–48 ■ Evaluate the indefinite integral.

7. $\int (2x + 1)(x^2 + x + 1)^3\,dx$

8. $\int x^3(1 - x^4)^5\,dx$

9. $\int \sqrt{x - 1}\,dx$

10. $\int \sqrt[3]{1 - x}\,dx$

11. $\int x^3\sqrt{2 + x^4}\,dx$

12. $\int x(x^2 + 1)^{3/2}\,dx$

13. $\int \frac{2}{(t + 1)^6}\,dt$

14. $\int \frac{1}{(1 - 3t)^4}\,dt$

15. $\int (1 - 2y)^{1.3}\,dy$

16. $\int \sqrt[5]{3 - 5y}\,dy$

17. $\int \cos 2\theta\,d\theta$

18. $\int \sec^2 3\theta\,d\theta$

19. $\int \frac{x}{\sqrt[4]{x + 2}}\,dx$

20. $\int \frac{x^2}{\sqrt{1 - x}}\,dx$

21. $\int t \sin(t^2)\,dt$

22. $\int \frac{(1 + \sqrt{x})^9}{\sqrt{x}}\,dx$

23. $\int x^3(1 - x^2)^{3/2}\,dx$

24. $\int t^2 \cos(1 - t^3)\,dt$

25. $\int \sec x \tan x\sqrt{1 + \sec x}\,dx$

26. $\int \frac{\cos\sqrt{x}}{\sqrt{x}}\,dx$

27. $\int \cos^4 x \sin x\,dx$

28. $\int \frac{ax + b}{\sqrt{ax^2 + 2bx + c}}\,dx$

29. $\int \sin(2x + 3)\,dx$

30. $\int \cos(7 - 3x)\,dx$

31. $\int (\sin 3\alpha - \sin 3x)\,dx$

32. $\int \sqrt[3]{x^3 + 1}\,x^5\,dx$

33. $\int x^a\sqrt{b + cx^{a+1}}\,dx \quad (c \neq 0, a \neq -1)$

34. $\int \cos x \cos(\sin x)\,dx$

35. $\int \frac{dx}{2x - 1}$

36. $\int \frac{x}{x^2 + 1}\,dx$

37. $\int \frac{(\ln x)^2}{x}\,dx$

38. $\int xe^{x^2}\,dx$

39. $\int e^x(1 + e^x)^{10}\,dx$

40. $\int \frac{\tan^{-1}x}{1 + x^2}\,dx$

41. $\int \frac{dx}{x \ln x}$

42. $\int e^x \sin(e^x)\,dx$

43. $\int \frac{e^x + 1}{e^x}\,dx$

44. $\int \frac{e^x}{e^x + 1}\,dx$

45. $\int \frac{x + 1}{x^2 + 2x}\,dx$

46. $\int \frac{\sin x}{1 + \cos^2 x}\,dx$

47. $\int \frac{1 + x}{1 + x^2}\,dx$

48. $\int \frac{x}{1 + x^4}\,dx$

49–52 ■ Evaluate the indefinite integral. Illustrate and check that your answer is reasonable by graphing both the function and its antiderivative (take $C = 0$).

49. $\int \frac{3x - 1}{(3x^2 - 2x + 1)^4}\,dx$

50. $\int \frac{x}{\sqrt{x^2 + 1}}\,dx$

51. $\int \sin^3 x \cos x\,dx$

52. $\int \tan^2\theta \sec^2\theta\,d\theta$

53–74 ■ Evaluate the definite integral, if it exists.

53. $\int_0^1 (2x - 1)^{100}\,dx$

54. $\int_0^{-4} \sqrt{1 - 2x}\,dx$

55. $\int_0^1 (x^4 + x)^5(4x^3 + 1)\,dx$

56. $\int_2^3 \frac{3x^2 - 1}{(x^3 - x)^2}\,dx$

57. $\int_1^2 x\sqrt{x - 1}\,dx$

58. $\int_0^4 \frac{x}{\sqrt{1 + 2x}}\,dx$

59. $\int_0^1 \cos \pi t\,dt$

60. $\int_0^{\pi/4} \sin 4t\,dt$

61. $\int_1^4 \frac{1}{x^2}\sqrt{1 + \frac{1}{x}}\,dx$

62. $\int_0^2 \frac{dx}{(2x - 3)^2}$

63. $\int_0^{\pi/3} \frac{\sin\theta}{\cos^2\theta}\,d\theta$

64. $\int_{-\pi/2}^{\pi/2} \frac{x^2 \sin x}{1 + x^6}\,dx$

65. $\int_0^{13} \frac{dx}{\sqrt[3]{(1 + 2x)^2}}$

66. $\int_{-\pi/3}^{\pi/3} \sin^5\theta\,d\theta$

67. $\int_0^4 \frac{dx}{(x - 2)^3}$

68. $\int_0^a x\sqrt{a^2 - x^2}\,dx$

69. $\int_0^a x\sqrt{x^2 + a^2}\,dx \quad (a > 0)$

70. $\int_{-a}^a x\sqrt{x^2 + a^2}\,dx$

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1. $(x^2 - 1)^{100}/200 + C$ **3.** $-\frac{1}{4}\cos 4x + C$

5. $-1/[2(x^2 + 6x)] + C$ **7.** $(x^2 + x + 1)^4/4 + C$

9. $\frac{2}{3}(x - 1)^{3/2} + C$ **11.** $(2 + x^4)^{3/2}/6 + C$

13. $-2/[5(t + 1)^5] + C$ **15.** $-(1 - 2y)^{2.3}/4.6 + C$

17. $\frac{1}{2}\sin 2\theta + C$ **19.** $\frac{4}{7}(x + 2)^{7/4} - \frac{8}{3}(x + 2)^{3/4} + C$

21. $-\frac{1}{2}\cos(t^2) + C$ **23.** $\frac{1}{7}(1 - x^2)^{7/2} - \frac{1}{5}(1 - x^2)^{5/2} + C$

25. $\frac{2}{3}(1 + \sec x)^{3/2} + C$ **27.** $-\frac{1}{5}\cos^5 x + C$

29. $-\frac{1}{2}\cos(2x + 3) + C$ **31.** $(\sin 3\alpha)x + \frac{1}{3}\cos 3x + C$

33. $2(b + cx^{a+1})^{3/2}/[3c(a + 1)] + C$

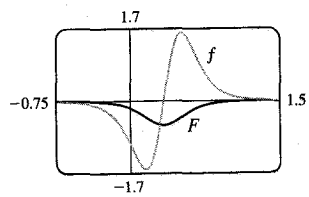
35. $\frac{1}{2}\ln|2x - 1| + C$ **37.** $(\ln x)^3/3 + C$

39. $(1 + e^x)^{11}/11 + C$ **41.** $\ln|\ln x| + C$

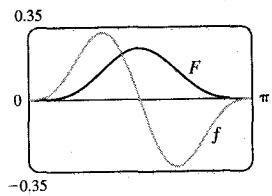
43. $x - e^{-x} + C$ **45.** $\frac{1}{2}\ln|x^2 + 2x| + C$

47. $\tan^{-1}x + \frac{1}{2}\ln(1 + x^2) + C$

49. $\dfrac{-1}{6(3x^2 - 2x + 1)^3} + C$



51. $\frac{1}{4}\sin^4 x + C$



53. $\frac{1}{101}$ **55.** $\frac{32}{3}$ **57.** $\frac{16}{15}$ **59.** 0

61. $(4\sqrt{2}/3) - (5\sqrt{5}/12)$ **63.** 1 **65.** 3

67. Does not exist **69.** $\frac{1}{3}(2\sqrt{2} - 1)a^3$ **71.** $\frac{1}{2}\ln 3$

73. 2 **75.** $\sqrt{3} - \frac{1}{3}$ **77.** 6π

79. $[5/(4\pi)][1 - \cos(2\pi t/5)]$ L **81.** 5 **87.** $\pi^2/4$