

EXERCISES 5.5

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

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

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

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

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

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

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

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. $\int (1 - 2y)^{13} dy$

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

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

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

19. $\int \frac{x}{\sqrt[3]{x + 2}} dx$

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

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

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

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

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

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

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

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

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


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

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

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

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

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

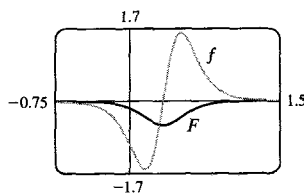
68. $\int_0^a x \sqrt{a^2 - x^2} dx$

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

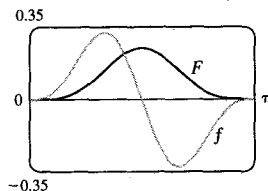
70. $\int_{-a}^a x \sqrt{x^2 + a^2} dx$

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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. $-\frac{1}{3} \cos^5 x + C$
 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. $\frac{-1}{6(3x^2 - 2x + 1)^3} + C$



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. $\pi^2/4$