Miscellaneous Exercises (page 484)

1. $(x^5/5) - (2x^3/3) + C$ 3. $\frac{1}{4}\tan^{-1}|(x+2)/4| + C$ 5. $\frac{1}{2}\tan 2\theta + C$ 7. $2(\sqrt{x} - \tan^{-1}\sqrt{x}) + C$
9. $\frac{1}{2}\ln(9+t^2) + C$ 11. $-(\theta + \cot\theta) + C$ 13. $-e^{\cos x} + C$ 15. $\frac{1}{4}\sin 2x - (x/2)\cos 2x + C$
17. $(z^5/5) + (8z^3/3) + 16z + C$ 19. $\frac{2}{9}(2-t)^{9/2} - \frac{12}{7}(2-t)^{7/2} + \frac{24}{5}(2-t)^{5/2} - \frac{16}{3}(2-t)^{3/2} + C$
21. $\frac{1}{3}\sin^3 x - \frac{1}{5}\sin^5 x + C$ 23. $\sqrt{2y+1} + C$ 25. $e^t + 2\ln|e^t - 2| + C$ 27. $\frac{1}{2}\ln|\cosh 2v| + C$
29. $\sin x + \cos x + \ln|\csc x - \cot x| + C$ 31. $\frac{1}{8}\ln|(x^2-2)/(x^2+2)| + C$ 33. $\ln|\ln x| + C$
35. $\ln|\cos|(\pi/4) - \theta|| + C$ 37. $[(ab)^x/\ln(ab)] + C$ 39. $a\sin^{-1}(x/a) - \sqrt{a^2 - x^2} + C$
41. $(x^3/3) + (x^2/2) - x - \ln|x-1| + C$ 43. $\frac{1}{24}(3y^2 - 6y)^4 + C$ 45. $-3[(x^2/2) + x + \ln|x-1|] + C$

47. $\frac{1}{3}(\sin 3x - \frac{1}{3}\sin^3 3x) + C$ 49. $-x - \ln|(x-2)/(x+2)| + C$
51. $\frac{1}{3}x^3\sin^{-1}x + \frac{1}{3}\sqrt{1-x^2} - \frac{1}{9}(1-x^2)^{3/2} + C$ 53. $6\sqrt{t+1} + 2\ln|(\sqrt{t+1} - 1)/(\sqrt{t+1} + 1)| + C$
55. $(x^2/4) + (x/4)\sin 2x + \frac{1}{8}\cos 2x$ 57. $(1/a)\ln|x/(x+a)| + C$ 59. $-\frac{1}{2}[w^2 + \ln|w^2 - 1|] + C$
61. Let $x = a\sin\theta$ 63. Let $x = a\sec\theta$ 65. Let $x = a\tan\theta$ 67. $\ln|(x + \sqrt{x^2 - a^2})/a| + C$

Miscellaneous Exercises

In Problems 1–60 evaluate each integral.

1. $\int x^2(x^2 - 2)\,dx$
2. $\int \sqrt{ax + b}\,dx$
3. $\int \dfrac{dx}{x^2 + 4x + 20}$
4. $\int x\sqrt{x+2}\,dx$
5. $\int \sec^2 2\theta\,d\theta$
6. $\int \dfrac{y^3 + y}{y+1}\,dy$
7. $\int \dfrac{\sqrt{x}\,dx}{1+x}$
8. $\int \sec^3\phi\tan\phi\,d\phi$
9. $\int \dfrac{t\,dt}{9 + t^2}$
10. $\int \dfrac{dt}{9 + t^2}$
11. $\int \cot^2\theta\,d\theta$
12. $\int \dfrac{x\,dx}{(1+x)^4}$
13. $\int e^{\cos x}\sin x\,dx$
14. $\int \sin^3\phi\,d\phi$
15. $\int x\sin 2x\,dx$
16. $\int \dfrac{(v-2)\,dv}{v^2 - 4v + 2}$
17. $\int (z^2 + 4)^2\,dz$
18. $\int v\csc^2 v\,dv$

From Mizrahi & Sullivan, "Calculus"

19. $\int t^3\sqrt{2-t}\,dt$

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

21. $\int \sin^2 x \cos^3 x\,dx$

22. $\int (4-x^2)^{3/2}\,dx$

23. $\int \frac{dy}{\sqrt{2y+1}}$

24. $\int \frac{3x^2+1}{x^3+2x^2-3x}\,dx$

25. $\int \frac{e^{2t}\,dt}{e^t-2}$

26. $\int \frac{2z+3}{\sqrt{1+2z}}\,dz$

27. $\int \tanh 2v\,dv$

28. $\int \frac{dy}{5+4y+4y^2}$

29. $\int \frac{\sin x+\cos x}{\tan x}\,dx$

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

31. $\int \frac{x\,dx}{x^4-4}$

32. $\int x^3 e^{x^2}\,dx$

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

34. $\int \frac{y^2\,dy}{(y+1)^3}$

35. $\int \tan\left(\frac{1}{4}\pi-\theta\right)d\theta$

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

37. $\int a^x b^x\,dx$

38. $\int \sin^2\theta \csc^2 2\theta\,d\theta$

39. $\int \sqrt{\frac{a+x}{a-x}}\,dx$

40. $\int \frac{dx}{\sqrt{16+4x-2x^2}}$

41. $\int \frac{x^3-2x}{x-1}\,dx$

42. $\int \ln(1-y)\,dy$

43. $\int (3y^2-6y)^3(y-1)\,dy$

44. $\int \cos^n\theta \sin\theta\,d\theta$

45. $\int \frac{3x^2\,dx}{1-x}$

46. $\int x^2 e^x\,dx$

47. $\int \cos^3 3x\,dx$

48. $\int \frac{dy}{\sqrt{2+3y^2}}$

49. $\int \frac{x^2\,dx}{4-x^2}$

50. $\int \csc^4 x\,dx$

51. $\int x^2 \sin^{-1} x\,dx$

52. $\int \frac{\sec^2 z\,dz}{a+b\tan z}$

53. $\int \frac{(3t+2)\,dt}{t\sqrt{t+1}}$

54. $\int e^{y/2}\,dy$

55. $\int x\cos^2 x\,dx$

56. $\int \frac{dv}{\sqrt{3v-v^2}}$

57. $\int \frac{dx}{x^2+ax}$

58. $\int \sin^4 y \cos^4 y\,dy$

59. $\int \frac{w^3\,dw}{1-w^2}$

60. $\int \frac{\cos^2 mx\,dx}{\sin^3 mx}$

In Problems 61–65 use a trigonometric substitution to derive each formula.

61. $\int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1}\left(\frac{x}{a}\right)+C$

62. $\int \frac{dx}{a^2+x^2} = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right)+C$

63. $\int \frac{dx}{x\sqrt{x^2-a^2}} = \frac{1}{a}\sec^{-1}\left(\frac{x}{a}\right)+C$

64. $\int \sqrt{x^2-a^2}\,dx = \frac{1}{2}x\sqrt{x^2-a^2}-\frac{1}{2}a^2\ln\left|x+\sqrt{x^2-a^2}\right|+C$