Exercises

Evaluate the integrals in Exercises 1–100.

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

2. $\displaystyle\int \csc^3 x \, dx$

3. $\displaystyle\int_0^1 \ln(1 + x) \, dx$

4. $\displaystyle\int_0^1 e^{\sqrt{x}} \, dx$

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

6. $\displaystyle\int \cos^4 x \, dx$

7. $\displaystyle\int \tan x \sec^5 x \, dx$

8. $\displaystyle\int \tan x \sec^6 x \, dx$

9. $\displaystyle\int \frac{1}{(x^2 + 25)^{3/2}} \, dx$

10. $\displaystyle\int \frac{1}{x^2 \sqrt{16 - x^2}} \, dx$

11 $\displaystyle\int \frac{\sqrt{4-x^2}}{x}\,dx$

12 $\displaystyle\int \frac{x}{(x^2+1)^2}\,dx$

13 $\displaystyle\int \frac{x^3+1}{x(x-1)^3}\,dx$

14 $\displaystyle\int \frac{1}{x+x^3}\,dx$

15 $\displaystyle\int \frac{x^3-20x^2-63x-198}{x^4-81}\,dx$

16 $\displaystyle\int \frac{x-1}{(x+2)^5}\,dx$

17 $\displaystyle\int \frac{x}{\sqrt{4+4x-x^2}}\,dx$

18 $\displaystyle\int \frac{x}{x^2+6x+13}\,dx$

19 $\displaystyle\int \frac{\sqrt[3]{x+8}}{x}\,dx$

20 $\displaystyle\int \frac{\sin x}{2\cos x+3}\,dx$

21 $\displaystyle\int e^{2x}\sin 3x\,dx$

22 $\displaystyle\int \cos(\ln x)\,dx$

23 $\displaystyle\int \sin^3 x\cos^3 x\,dx$

24 $\displaystyle\int \cot^2 3x\,dx$

25 $\displaystyle\int \frac{x}{\sqrt{4-x^2}}\,dx$

26 $\displaystyle\int \frac{1}{x\sqrt{9x^2+4}}\,dx$

27 $\displaystyle\int \frac{x^5-x^3+1}{x^3+2x^2}\,dx$

28 $\displaystyle\int \frac{x^3}{x^3-3x^2+9x-27}\,dx$

29 $\displaystyle\int \frac{1}{x^{3/2}+x^{1/2}}\,dx$

30 $\displaystyle\int \frac{2x+1}{(x+5)^{100}}\,dx$

31 $\displaystyle\int e^x\sec e^x\,dx$

32 $\displaystyle\int x\tan x^2\,dx$

33 $\displaystyle\int x^2\sin 5x\,dx$

34 $\displaystyle\int \sin 2x\cos x\,dx$

35 $\displaystyle\int \sin^3 x\cos^{1/2} x\,dx$

36 $\displaystyle\int \sin 3x\cot 3x\,dx$

37 $\displaystyle\int e^x\sqrt{1+e^x}\,dx$

38 $\displaystyle\int x(4x^2+25)^{-1/2}\,dx$

39 $\displaystyle\int \frac{x^2}{\sqrt{4x^2+25}}\,dx$

40 $\displaystyle\int \frac{3x+2}{x^2+8x+25}\,dx$

41 $\displaystyle\int \sec^2 x\tan^2 x\,dx$

42 $\displaystyle\int \sin^2 x\cos^5 x\,dx$

43 $\displaystyle\int x\cot x\csc x\,dx$

44 $\displaystyle\int (1+\csc 2x)^2\,dx$

45 $\displaystyle\int x^2(8-x^3)^{1/3}\,dx$

46 $\displaystyle\int x(\ln x)^2\,dx$

47 $\displaystyle\int \cos\sqrt{x}\,dx$

48 $\displaystyle\int x\sqrt{5-3x}\,dx$

49 $\displaystyle\int \frac{e^{3x}}{1+e^x}\,dx$

50 $\displaystyle\int \frac{e^{2x}}{4+e^{4x}}\,dx$

51 $\displaystyle\int \frac{x^2 - 4x + 3}{\sqrt{x}}\,dx$

52 $\displaystyle\int \frac{\cos^3 x}{\sqrt{1 + \sin x}}\,dx$

53 $\displaystyle\int \frac{x^3}{\sqrt{16 - x^2}}\,dx$

54 $\displaystyle\int \frac{x}{25 - 9x^2}\,dx$

55 $\displaystyle\int \frac{1 - 2x}{x^2 + 12x + 35}\,dx$

56 $\displaystyle\int \frac{7}{x^2 - 6x + 18}\,dx$

57 $\displaystyle\int \tan^{-1} 5x\,dx$

58 $\displaystyle\int \sin^4 3x\,dx$

59 $\displaystyle\int \frac{e^{\tan x}}{\cos^2 x}\,dx$

60 $\displaystyle\int \frac{x}{\csc 5x^2}\,dx$

61 $\displaystyle\int \frac{1}{\sqrt{7 + 5x^2}}\,dx$

62 $\displaystyle\int \frac{2x + 3}{x^2 + 4}\,dx$

63 $\displaystyle\int \cot^6 x\,dx$

64 $\displaystyle\int \cot^5 x \csc x\,dx$

65 $\displaystyle\int x^3\sqrt{x^2 - 25}\,dx$

66 $\displaystyle\int (\sin x)10^{\cos x}\,dx$

67 $\displaystyle\int (x^2 - \operatorname{sech}^2 4x)\,dx$

68 $\displaystyle\int x \cosh x\,dx$

69 $\displaystyle\int x^2 e^{-4x}\,dx$

70 $\displaystyle\int x^5\sqrt{x^3 + 1}\,dx$

71 $\displaystyle\int \frac{3}{\sqrt{11 - 10x - x^2}}\,dx$

72 $\displaystyle\int \frac{12x^3 + 7x}{x^4}\,dx$

73 $\displaystyle\int \tan 7x \cos 7x\,dx$

74 $\displaystyle\int e^{1 + \ln 5x}\,dx$

75 $\displaystyle\int \frac{4x^2 - 12x - 10}{(x - 2)(x^2 - 4x + 3)}\,dx$

76 $\displaystyle\int \frac{1}{x^4\sqrt{16 - x^2}}\,dx$

77 $\displaystyle\int (x^3 + 1)\cos x\,dx$

78 $\displaystyle\int (x - 3)^2(x + 1)\,dx$

79 $\displaystyle\int \frac{\sqrt{9 - 4x^2}}{x^2}\,dx$

80 $\displaystyle\int \frac{4x^3 - 15x^2 - 6x + 81}{x^4 - 18x^2 + 81}\,dx$

81 $\displaystyle\int (x - \cot 3x)^2\,dx$

82 $\displaystyle\int x(x^2 + 5)^{3/4}\,dx$

83 $\displaystyle\int \frac{1}{x(\sqrt{x} + \sqrt[4]{x})}\,dx$

84 $\displaystyle\int \frac{x}{\cos^2 4x}\,dx$

85 $\displaystyle\int \frac{\sin x}{\sqrt{1 + \cos x}}\,dx$

86 $\displaystyle\int \frac{4x^2 - 6x + 4}{(x^2 + 4)(x - 2)}\,dx$

87 $\displaystyle\int \frac{x^2}{(25 + x^2)^2}\,dx$

88 $\displaystyle\int \sin^4 x \cos^3 x\,dx$

89 $\displaystyle\int \tan^3 x \sec x\,dx$

90 $\displaystyle\int \frac{x}{\sqrt{4 + 9x^2}}\,dx$

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91 $\displaystyle\int \frac{2x^3 + 4x^2 + 10x + 13}{x^4 + 9x^2 + 20}\,dx$

92 $\displaystyle\int \frac{\sin x}{(1 + \cos x)^3}\,dx$

93 $\displaystyle\int \frac{(x^2 - 2)^2}{x}\,dx$

94 $\displaystyle\int \cot^2 x \csc x\,dx$

95 $\displaystyle\int x^{3/2} \ln x\,dx$

96 $\displaystyle\int \frac{x}{\sqrt[3]{x} - 1}\,dx$

97 $\displaystyle\int \frac{x^2}{\sqrt[3]{2x + 3}}\,dx$

98 $\displaystyle\int \frac{1 - \sin x}{\cot x}\,dx$

99 $\displaystyle\int x^3 e^{x^2}\,dx$

100 $\displaystyle\int (x + 2)^2(x + 1)^{10}\,dx$

101 The region between the graph of $y = \sin x$ and the x-axis from $x = 0$ to $x = \pi$ is revolved about the y-axis. Find the volume of the resulting solid.

102 The region bounded by the graphs of $y = \tan x$, $y = 0$, $x = \pi/6$, and $x = \pi/4$ is revolved about the x-axis. Find the volume of the resulting solid.

103 Find the arc length of the graph of $y = \ln \sec x$ from $A(0,0)$ to $B(\pi/3, \ln 2)$.

104 Find the area of the region bounded by the coordinate axes and the graphs of $y = (9 + 4x^2)^{-1/2}$ and $x = 2$.

In Exercises 105 and 106 sketch the region bounded by the graphs of the given equations and find the centroid.

105 $y = x^3, y = x^2$

106 $y = \cos x, y = 0, x = 0, x = \pi/2$

In Exercises 107 and 108 find the centroid of the solid generated by revolving the region bounded by the graphs of the given equations about the x-axis.

107 $y = \sqrt{x}, y = 0, x = 4$

108 $y = \sec x, y = 0, x = 0, x = \pi/4$

109 The region bounded by the graphs of $y = e^{-3x}, y = 0, x = 0$, and $x = 1$ is revolved about the y-axis. Find the centroid of the resulting solid.

110 The region bounded by the graphs of $y = \sin(x^2), y = 0, x = 0$, and $x = \sqrt{\pi}$ is revolved about the y-axis. Find the centroid of the resulting solid.