



A Brief Table of Integrals

$$1. \int u \, dv = uv - \int v \, du$$

$$3. \int \cos u \, du = \sin u + C$$

$$5. \int (ax+b)^n \, dx = \frac{(ax+b)^{n+1}}{a(n+1)} + C, \quad n \neq -1$$

$$7. \int x(ax+b)^n \, dx = \frac{(ax+b)^{n+1}}{a^2} \left[\frac{ax+b}{n+2} - \frac{b}{n+1} \right] + C, \quad n \neq -1, -2$$

$$8. \int x(ax+b)^{-1} \, dx = \frac{x}{a} - \frac{b}{a^2} \ln |ax+b| + C$$

$$9. \int x(ax+b)^{-2} \, dx = \frac{1}{a^2} \left[\ln |ax+b| + \frac{b}{ax+b} \right] + C$$

$$11. \int (\sqrt{ax+b})^n \, dx = \frac{2}{a} \frac{(\sqrt{ax+b})^{n+2}}{n+2} + C, \quad n \neq -2$$

$$13. \text{ a) } \int \frac{dx}{x\sqrt{ax-b}} = \frac{2}{\sqrt{b}} \tan^{-1} \sqrt{\frac{ax-b}{b}} + C$$

$$\text{b) } \int \frac{dx}{x\sqrt{ax+b}} = \frac{1}{\sqrt{b}} \ln \left| \frac{\sqrt{ax+b} - \sqrt{b}}{\sqrt{ax+b} + \sqrt{b}} \right| + C$$

$$14. \int \frac{\sqrt{ax+b}}{x^2} \, dx = -\frac{\sqrt{ax+b}}{x} + \frac{a}{2} \int \frac{dx}{x\sqrt{ax+b}} + C$$

$$16. \int \frac{dx}{a^2+x^2} = \frac{1}{a} \tan^{-1} \frac{x}{a} + C$$

$$18. \int \frac{dx}{a^2-x^2} = \frac{1}{2a} \ln \left| \frac{x+a}{x-a} \right| + C$$

$$20. \int \frac{dx}{\sqrt{a^2+x^2}} = \sinh^{-1} \frac{x}{a} + C = \ln(x + \sqrt{a^2+x^2}) + C$$

$$22. \int x^2 \sqrt{a^2+x^2} \, dx = \frac{x}{8} (a^2+2x^2)\sqrt{a^2+x^2} - \frac{a^4}{8} \ln(x + \sqrt{a^2+x^2}) + C$$

$$23. \int \frac{\sqrt{a^2+x^2}}{x} \, dx = \sqrt{a^2+x^2} - a \ln \left| \frac{a+\sqrt{a^2+x^2}}{x} \right| + C$$

$$25. \int \frac{x^2}{\sqrt{a^2+x^2}} \, dx = -\frac{a^2}{2} \ln(x + \sqrt{a^2+x^2}) + \frac{x\sqrt{a^2+x^2}}{2} + C$$

$$26. \int \frac{dx}{x\sqrt{a^2+x^2}} = -\frac{1}{a} \ln \left| \frac{a+\sqrt{a^2+x^2}}{x} \right| + C$$

$$28. \int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1} \frac{x}{a} + C$$

$$2. \int a^u \, du = \frac{a^u}{\ln a} + C, \quad a \neq 1, \quad a > 0$$

$$4. \int \sin u \, du = -\cos u + C$$

$$6. \int (ax+b)^{-1} \, dx = \frac{1}{a} \ln |ax+b| + C$$

$$10. \int \frac{dx}{x(ax+b)} = \frac{1}{b} \ln \left| \frac{x}{ax+b} \right| + C$$

$$12. \int \frac{\sqrt{ax+b}}{x} \, dx = 2\sqrt{ax+b} + b \int \frac{dx}{x\sqrt{ax+b}}$$

$$15. \int \frac{dx}{x^2\sqrt{ax+b}} = -\frac{\sqrt{ax+b}}{bx} - \frac{a}{2b} \int \frac{dx}{x\sqrt{ax+b}} + C$$

$$17. \int \frac{dx}{(a^2+x^2)^2} = \frac{x}{2a^2(a^2+x^2)} + \frac{1}{2a^3} \tan^{-1} \frac{x}{a} + C$$

$$19. \int \frac{dx}{(a^2-x^2)^2} = \frac{x}{2a^2(a^2-x^2)} + \frac{1}{4a^3} \ln \left| \frac{x+a}{x-a} \right| + C$$

$$21. \int \sqrt{a^2+x^2} \, dx = \frac{x}{2} \sqrt{a^2+x^2} + \frac{a^2}{2} \ln(x + \sqrt{a^2+x^2}) + C$$

$$24. \int \frac{\sqrt{a^2+x^2}}{x^2} \, dx = \ln(x + \sqrt{a^2+x^2}) - \frac{\sqrt{a^2+x^2}}{x} + C$$

$$27. \int \frac{dx}{x^2\sqrt{a^2+x^2}} = -\frac{\sqrt{a^2+x^2}}{a^2x} + C$$

$$29. \int \sqrt{a^2-x^2} \, dx = \frac{x}{2} \sqrt{a^2-x^2} + \frac{a^2}{2} \sin^{-1} \frac{x}{a} + C$$

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30. $\int x^2 \sqrt{a^2 - x^2} dx = \frac{a^4}{8} \sin^{-1} \frac{x}{a} - \frac{1}{8} x \sqrt{a^2 - x^2} (a^2 - 2x^2) + C$
31. $\int \frac{\sqrt{a^2 - x^2}}{x} dx = \sqrt{a^2 - x^2} - a \ln \left| \frac{a + \sqrt{a^2 - x^2}}{x} \right| + C$
32. $\int \frac{\sqrt{a^2 - x^2}}{x^2} dx = -\sin^{-1} \frac{x}{a} - \frac{\sqrt{a^2 - x^2}}{x} + C$
33. $\int \frac{x^2}{\sqrt{a^2 - x^2}} dx = \frac{a^2}{2} \sin^{-1} \frac{x}{a} - \frac{1}{2} x \sqrt{a^2 - x^2} + C$
34. $\int \frac{dx}{x \sqrt{a^2 - x^2}} = -\frac{1}{a} \ln \left| \frac{a + \sqrt{a^2 - x^2}}{x} \right| + C$
35. $\int \frac{dx}{x^2 \sqrt{a^2 - x^2}} = -\frac{\sqrt{a^2 - x^2}}{a^2 x} + C$
36. $\int \frac{dx}{\sqrt{x^2 - a^2}} = \cosh^{-1} \frac{x}{a} + C = \ln \left| x + \sqrt{x^2 - a^2} \right| + C$
37. $\int \sqrt{x^2 - a^2} dx = \frac{x}{2} \sqrt{x^2 - a^2} - \frac{a^2}{2} \ln \left| x + \sqrt{x^2 - a^2} \right| + C$
38. $\int (\sqrt{x^2 - a^2})^n dx = \frac{x(\sqrt{x^2 - a^2})^n}{n+1} - \frac{na^2}{n+1} \int (\sqrt{x^2 - a^2})^{n-2} dx, \quad n \neq -1$
39. $\int \frac{dx}{(\sqrt{x^2 - a^2})^n} = \frac{x(\sqrt{x^2 - a^2})^{2-n}}{(2-n)a^2} - \frac{n-3}{(n-2)a^2} \int \frac{dx}{(\sqrt{x^2 - a^2})^{n-2}}, \quad n \neq 2$
40. $\int x(\sqrt{x^2 - a^2})^n dx = \frac{(\sqrt{x^2 - a^2})^{n+2}}{n+2} + C, \quad n \neq -2$
41. $\int x^2 \sqrt{x^2 - a^2} dx = \frac{x}{8}(2x^2 - a^2)\sqrt{x^2 - a^2} - \frac{a^4}{8} \ln \left| x + \sqrt{x^2 - a^2} \right| + C$
42. $\int \frac{\sqrt{x^2 - a^2}}{x} dx = \sqrt{x^2 - a^2} - a \sec^{-1} \left| \frac{x}{a} \right| + C$
43. $\int \frac{\sqrt{x^2 - a^2}}{x^2} dx = \ln \left| x + \sqrt{x^2 - a^2} \right| - \frac{\sqrt{x^2 - a^2}}{x} + C$
44. $\int \frac{x^2}{\sqrt{x^2 - a^2}} dx = \frac{a^2}{2} \ln \left| x + \sqrt{x^2 - a^2} \right| + \frac{x}{2} \sqrt{x^2 - a^2} + C$
45. $\int \frac{dx}{x \sqrt{x^2 - a^2}} = \frac{1}{a} \sec^{-1} \left| \frac{x}{a} \right| + C = \frac{1}{a} \cos^{-1} \left| \frac{a}{x} \right| + C$
46. $\int \frac{dx}{x^2 \sqrt{x^2 - a^2}} = \frac{\sqrt{x^2 - a^2}}{a^2 x} + C$
47. $\int \frac{dx}{\sqrt{2ax - x^2}} = \sin^{-1} \left(\frac{x-a}{a} \right) + C$
48. $\int \sqrt{2ax - x^2} dx = \frac{x-a}{2} \sqrt{2ax - x^2} + \frac{a^2}{2} \sin^{-1} \left(\frac{x-a}{a} \right) + C$
49. $\int (\sqrt{2ax - x^2})^n dx = \frac{(x-a)(\sqrt{2ax - x^2})^n}{n+1} + \frac{na^2}{n+1} \int (\sqrt{2ax - x^2})^{n-2} dx$
50. $\int \frac{dx}{(\sqrt{2ax - x^2})^n} = \frac{(x-a)(\sqrt{2ax - x^2})^{2-n}}{(n-2)a^2} + \frac{n-3}{(n-2)a^2} \int \frac{dx}{(\sqrt{2ax - x^2})^{n-2}}$
51. $\int x \sqrt{2ax - x^2} dx = \frac{(x+a)(2x-3a)\sqrt{2ax - x^2}}{6} + \frac{a^3}{2} \sin^{-1} \left(\frac{x-a}{a} \right) + C$
52. $\int \frac{\sqrt{2ax - x^2}}{x} dx = \sqrt{2ax - x^2} + a \sin^{-1} \left(\frac{x-a}{a} \right) + C$
53. $\int \frac{\sqrt{2ax - x^2}}{x^2} dx = -2\sqrt{\frac{2a-x}{x}} - \sin^{-1} \left(\frac{x-a}{a} \right) + C$
54. $\int \frac{x dx}{\sqrt{2ax - x^2}} = a \sin^{-1} \left(\frac{x-a}{a} \right) - \sqrt{2ax - x^2} + C$
55. $\int \frac{dx}{x \sqrt{2ax - x^2}} = -\frac{1}{a} \sqrt{\frac{2a-x}{x}} + C$

56. $\int \sin ax dx = -\frac{1}{a} \cos ax + C$

58. $\int \sin^2 ax dx = \frac{x}{2} - \frac{\sin 2ax}{4a} + C$

60. $\int \sin^n ax dx = -\frac{\sin^{n-1} ax \cos ax}{na} + \frac{n-1}{n} \int \sin^{n-2} ax dx$

57. $\int \cos ax dx = \frac{1}{a} \sin ax + C$

59. $\int \cos^2 ax dx = \frac{x}{2} + \frac{\sin 2ax}{4a} + C$

61. $\int \cos^n ax dx = \frac{\cos^{n-1} ax \sin ax}{na} + \frac{n-1}{n} \int \cos^{n-2} ax dx$

62. a) $\int \sin ax \cos bx dx = -\frac{\cos(a+b)x}{2(a+b)} - \frac{\cos(a-b)x}{2(a-b)} + C, \quad a^2 \neq b^2$

b) $\int \sin ax \sin bx dx = \frac{\sin(a-b)x}{2(a-b)} - \frac{\sin(a+b)x}{2(a+b)} + C, \quad a^2 \neq b^2$

c) $\int \cos ax \cos bx dx = \frac{\sin(a-b)x}{2(a-b)} + \frac{\sin(a+b)x}{2(a+b)} + C, \quad a^2 \neq b^2$

63. $\int \sin ax \cos ax dx = -\frac{\cos 2ax}{4a} + C$

65. $\int \frac{\cos ax}{\sin ax} dx = \frac{1}{a} \ln |\sin ax| + C$

67. $\int \frac{\sin ax}{\cos ax} dx = -\frac{1}{a} \ln |\cos ax| + C$

68. $\int \sin^n ax \cos^m ax dx = -\frac{\sin^{n-1} ax \cos^{m+1} ax}{a(m+n)} + \frac{n-1}{m+n} \int \sin^{n-2} ax \cos^m ax dx, \quad n \neq -m \quad (\text{reduces } \sin^n ax)$

69. $\int \sin^n ax \cos^m ax dx = \frac{\sin^{n+1} ax \cos^{m-1} ax}{a(m+n)} + \frac{m-1}{m+n} \int \sin^n ax \cos^{m-2} ax dx, \quad m \neq -n \quad (\text{reduces } \cos^m ax)$

70. $\int \frac{dx}{b+c \sin ax} = \frac{-2}{a\sqrt{b^2-c^2}} \tan^{-1} \left[\sqrt{\frac{b-c}{b+c}} \tan \left(\frac{\pi}{4} - \frac{ax}{2} \right) \right] + C, \quad b^2 > c^2$

71. $\int \frac{dx}{b+c \sin ax} = \frac{-1}{a\sqrt{c^2-b^2}} \ln \left| \frac{c+b \sin ax + \sqrt{c^2-b^2} \cos ax}{b+c \sin ax} \right| + C, \quad b^2 < c^2$

72. $\int \frac{dx}{1+\sin ax} = -\frac{1}{a} \tan \left(\frac{\pi}{4} - \frac{ax}{2} \right) + C$

73. $\int \frac{dx}{1-\sin ax} = \frac{1}{a} \tan \left(\frac{\pi}{4} + \frac{ax}{2} \right) + C$

74. $\int \frac{dx}{b+c \cos ax} = \frac{2}{a\sqrt{b^2-c^2}} \tan^{-1} \left[\sqrt{\frac{b-c}{b+c}} \tan \frac{ax}{2} \right] + C, \quad b^2 > c^2$

75. $\int \frac{dx}{b+c \cos ax} = \frac{1}{a\sqrt{c^2-b^2}} \ln \left| \frac{c+b \cos ax + \sqrt{c^2-b^2} \sin ax}{b+c \cos ax} \right| + C, \quad b^2 < c^2$

76. $\int \frac{dx}{1+\cos ax} = \frac{1}{a} \tan \frac{ax}{2} + C$

77. $\int \frac{dx}{1-\cos ax} = -\frac{1}{a} \cot \frac{ax}{2} + C$

78. $\int x \sin ax dx = \frac{1}{a^2} \sin ax - \frac{x}{a} \cos ax + C$

79. $\int x \cos ax dx = \frac{1}{a^2} \cos ax + \frac{x}{a} \sin ax + C$

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80. $\int x^n \sin ax dx = -\frac{x^n}{a} \cos ax + \frac{n}{a} \int x^{n-1} \cos ax dx$
81. $\int x^n \cos ax dx = \frac{x^n}{a} \sin ax - \frac{n}{a} \int x^{n-1} \sin ax dx$
82. $\int \tan ax dx = \frac{1}{a} \ln |\sec ax| + C$
83. $\int \cot ax dx = \frac{1}{a} \ln |\sin ax| + C$
84. $\int \tan^2 ax dx = \frac{1}{a} \tan ax - x + C$
85. $\int \cot^2 ax dx = -\frac{1}{a} \cot ax - x + C$
86. $\int \tan^n ax dx = \frac{\tan^{n-1} ax}{a(n-1)} - \int \tan^{n-2} ax dx, \quad n \neq 1$
87. $\int \cot^n ax dx = -\frac{\cot^{n-1} ax}{a(n-1)} - \int \cot^{n-2} ax dx, \quad n \neq 1$
88. $\int \sec ax dx = \frac{1}{a} \ln |\sec ax + \tan ax| + C$
89. $\int \csc ax dx = -\frac{1}{a} \ln |\csc ax + \cot ax| + C$
90. $\int \sec^2 ax dx = \frac{1}{a} \tan ax + C$
91. $\int \csc^2 ax dx = -\frac{1}{a} \cot ax + C$
92. $\int \sec^n ax dx = \frac{\sec^{n-2} ax \tan ax}{a(n-1)} + \frac{n-2}{n-1} \int \sec^{n-2} ax dx, \quad n \neq 1$
93. $\int \csc^n ax dx = -\frac{\csc^{n-2} ax \cot ax}{a(n-1)} + \frac{n-2}{n-1} \int \csc^{n-2} ax dx, \quad n \neq 1$
94. $\int \sec^n ax \tan ax dx = \frac{\sec^n ax}{na} + C, \quad n \neq 0$
95. $\int \csc^n ax \cot ax dx = -\frac{\csc^n ax}{na} + C, \quad n \neq 0$
96. $\int \sin^{-1} ax dx = x \sin^{-1} ax + \frac{1}{a} \sqrt{1-a^2x^2} + C$
97. $\int \cos^{-1} ax dx = x \cos^{-1} ax - \frac{1}{a} \sqrt{1-a^2x^2} + C$
98. $\int \tan^{-1} ax dx = x \tan^{-1} ax - \frac{1}{2a} \ln(1+a^2x^2) + C$
99. $\int x^n \sin^{-1} ax dx = \frac{x^{n+1}}{n+1} \sin^{-1} ax - \frac{a}{n+1} \int \frac{x^{n+1} dx}{\sqrt{1-a^2x^2}}, \quad n \neq -1$
100. $\int x^n \cos^{-1} ax dx = \frac{x^{n+1}}{n+1} \cos^{-1} ax + \frac{a}{n+1} \int \frac{x^{n+1} dx}{\sqrt{1-a^2x^2}}, \quad n \neq -1$
101. $\int x^n \tan^{-1} ax dx = \frac{x^{n+1}}{n+1} \tan^{-1} ax - \frac{a}{n+1} \int \frac{x^{n+1} dx}{1+a^2x^2}, \quad n \neq -1$
102. $\int e^{ax} dx = \frac{1}{a} e^{ax} + C$
103. $\int b^{ax} dx = \frac{1}{a} \frac{b^{ax}}{\ln b} + C, \quad b > 0, \quad b \neq 1$
104. $\int x e^{ax} dx = \frac{e^{ax}}{a^2} (ax - 1) + C$
105. $\int x^n e^{ax} dx = \frac{1}{a} x^n e^{ax} - \frac{n}{a} \int x^{n-1} e^{ax} dx$
106. $\int x^n b^{ax} dx = \frac{x^n b^{ax}}{a \ln b} - \frac{n}{a \ln b} \int x^{n-1} b^{ax} dx, \quad b > 0, \quad b \neq 1$
107. $\int e^{ax} \sin bx dx = \frac{e^{ax}}{a^2+b^2} (a \sin bx - b \cos bx) + C$
108. $\int e^{ax} \cos bx dx = \frac{e^{ax}}{a^2+b^2} (a \cos bx + b \sin bx) + C$
109. $\int \ln ax dx = x \ln ax - x + C$
110. $\int x^n (\ln ax)^m dx = \frac{x^{n+1} (\ln ax)^m}{n+1} - \frac{m}{n+1} \int x^n (\ln ax)^{m-1} dx, \quad n \neq -1$
111. $\int x^{-1} (\ln ax)^m dx = \frac{(\ln ax)^{m+1}}{m+1} + C, \quad m \neq -1$
112. $\int \frac{dx}{x \ln ax} = \ln |\ln ax| + C$

- 113.** $\int \sinh ax dx = \frac{1}{a} \cosh ax + C$
- 114.** $\int \cosh ax dx = \frac{1}{a} \sinh ax + C$
- 115.** $\int \sinh^2 ax dx = \frac{\sinh 2ax}{4a} - \frac{x}{2} + C$
- 116.** $\int \cosh^2 ax dx = \frac{\sinh 2ax}{4a} + \frac{x}{2} + C$
- 117.** $\int \sinh^n ax dx = \frac{\sinh^{n-1} ax \cosh ax}{na} - \frac{n-1}{n} \int \sinh^{n-2} ax dx, \quad n \neq 0$
- 118.** $\int \cosh^n ax dx = \frac{\cosh^{n-1} ax \sinh ax}{na} + \frac{n-1}{n} \int \cosh^{n-2} ax dx, \quad n \neq 0$
- 119.** $\int x \sinh ax dx = \frac{x}{a} \cosh ax - \frac{1}{a^2} \sinh ax + C$
- 120.** $\int x \cosh ax dx = \frac{x}{a} \sinh ax - \frac{1}{a^2} \cosh ax + C$
- 121.** $\int x^n \sinh ax dx = \frac{x^n}{a} \cosh ax - \frac{n}{a} \int x^{n-1} \cosh ax dx$
- 122.** $\int x^n \cosh ax dx = \frac{x^n}{a} \sinh ax - \frac{n}{a} \int x^{n-1} \sinh ax dx$
- 123.** $\int \tanh ax dx = \frac{1}{a} \ln(\cosh ax) + C$
- 124.** $\int \coth ax dx = \frac{1}{a} \ln |\sinh ax| + C$
- 125.** $\int \tanh^2 ax dx = x - \frac{1}{a} \tanh ax + C$
- 126.** $\int \coth^2 ax dx = x - \frac{1}{a} \coth ax + C$
- 127.** $\int \tanh^n ax dx = -\frac{\tanh^{n-1} ax}{(n-1)a} + \int \tanh^{n-2} ax dx, \quad n \neq 1$
- 128.** $\int \coth^n ax dx = -\frac{\coth^{n-1} ax}{(n-1)a} + \int \coth^{n-2} ax dx, \quad n \neq 1$
- 129.** $\int \operatorname{sech} ax dx = \frac{1}{a} \sin^{-1}(\tanh ax) + C$
- 130.** $\int \operatorname{csch} ax dx = \frac{1}{a} \ln \left| \tanh \frac{ax}{2} \right| + C$
- 131.** $\int \operatorname{sech}^2 ax dx = \frac{1}{a} \tanh ax + C$
- 132.** $\int \operatorname{csch}^2 ax dx = -\frac{1}{a} \coth ax + C$
- 133.** $\int \operatorname{sech}^n ax dx = \frac{\operatorname{sech}^{n-2} ax \tanh ax}{(n-1)a} + \frac{n-2}{n-1} \int \operatorname{sech}^{n-2} ax dx, \quad n \neq 1$
- 134.** $\int \operatorname{csch}^n ax dx = -\frac{\operatorname{csch}^{n-2} ax \coth ax}{(n-1)a} - \frac{n-2}{n-1} \int \operatorname{csch}^{n-2} ax dx, \quad n \neq 1$
- 135.** $\int \operatorname{sech}^n ax \tanh ax dx = -\frac{\operatorname{sech}^n ax}{na} + C, \quad n \neq 0$
- 136.** $\int \operatorname{csch}^n ax \coth ax dx = -\frac{\operatorname{csch}^n ax}{na} + C, \quad n \neq 0$
- 137.** $\int e^{ax} \sinh bx dx = \frac{e^{ax}}{2} \left[\frac{e^{bx}}{a+b} - \frac{e^{-bx}}{a-b} \right] + C, \quad a^2 \neq b^2$
- 138.** $\int e^{ax} \cosh bx dx = \frac{e^{ax}}{2} \left[\frac{e^{bx}}{a+b} + \frac{e^{-bx}}{a-b} \right] + C, \quad a^2 \neq b^2$
- 139.** $\int_0^\infty x^{n-1} e^{-x} dx = \Gamma(n) = (n-1)!, \quad n > 0$
- 140.** $\int_0^\infty e^{-ax^2} dx = \frac{1}{2} \sqrt{\frac{\pi}{a}}, \quad a > 0$
- 141.** $\int_0^{\pi/2} \sin^n x dx = \int_0^{\pi/2} \cos^n x dx = \begin{cases} \frac{1 \cdot 3 \cdot 5 \cdots (n-1)}{2 \cdot 4 \cdot 6 \cdots n} \cdot \frac{\pi}{2}, & \text{if } n \text{ is an even integer } \geq 2 \\ \frac{2 \cdot 4 \cdot 6 \cdots (n-1)}{3 \cdot 5 \cdot 7 \cdots n}, & \text{if } n \text{ is an odd integer } \geq 3 \end{cases}$