Table of Integration Formulas

In all integrals, assume that *k*, *n*, *a*, and *b* represent real numbers.

Part One: Integrals Involving Powers

1. $\int k\,dx = kx + C$

2. $\int x^n\,dx = \frac{1}{n+1}x^{n+1} + C,\ n \neq -1$

3. $\int x^{-1}dx = \int \frac{1}{x}dx = \ln|x| + C$

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

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

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

7. $\int \frac{1}{(x+a)(x+b)}dx = \frac{1}{b-a}[\ln|x+a| - \ln|x+b|] + C = \frac{1}{b-a}\ln\left|\frac{x+a}{x+b}\right| + C \text{ if } a \neq b$

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

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

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

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

Part Two: Integrals Involving Trigonometric Functions

12. $\int \sin(ax)\,dx = \frac{-1}{a}\cos(ax) + C$

13. $\int \cos(ax)\,dx = \frac{1}{a}\sin(ax) + C$

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14. $$\int \tan(ax)\,dx = \int \frac{\sin(ax)}{\cos(ax)}\,dx = \frac{-1}{a}\ln\left|\cos(ax)\right| + C = \frac{1}{a}\ln\left|\sec(ax)\right| + C$$

15. $$\int \cot(ax)\,dx = \int \frac{\cos(ax)}{\sin(ax)}\,dx = \frac{1}{a}\ln\left|\sin(ax)\right| + C$$

16. $$\int \sec(ax)\,dx = \frac{1}{a}\ln\left|\sec(ax) + \tan(ax)\right| + C$$

17. $$\int \csc(ax)\,dx = \frac{-1}{a}\ln\left|\csc(ax) + \cot(ax)\right| + C$$

18. $$\int \sin^2(ax)\,dx = \frac{1}{2}x - \frac{1}{4a}\sin(2ax) + C = \frac{1}{2}x - \frac{1}{2a}\sin(ax)\cos(ax) + C$$

19. $$\int \cos^2(ax)\,dx = \frac{1}{2}x + \frac{1}{4a}\sin(2ax) + C = \frac{1}{2}x + \frac{1}{2a}\sin(ax)\cos(ax) + C$$

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

21. $$\int \cot^2(ax)\,dx = \frac{-1}{a}\cot(ax) - x + C$$

22. $$\int \sec^2(ax)\,dx = \frac{1}{a}\tan(ax) + C$$

23. $$\int \csc^2(ax)\,dx = \frac{-1}{a}\cot(ax) + C$$

24. $$\int \sin^3(ax)\,dx = \frac{-1}{3a}\sin^2(ax)\cos(ax) - \frac{2}{3a}\cos(ax) + C$$

25. $$\int \cos^3(ax)\,dx = \frac{1}{3a}\cos^2(ax)\sin(ax) + \frac{2}{3a}\sin(ax) + C$$

26. $$\int \tan^3(ax)\,dx = \frac{1}{2a}\tan^2(ax) + \frac{1}{a}\ln\left|\cos(ax)\right| + C$$

27. $$\int \cot^3(ax)\,dx = \frac{-1}{2a}\cot^2(ax) - \frac{1}{a}\ln\left|\sin(ax)\right| + C$$

28. $$\int \sec^3(ax)\,dx = \frac{1}{2a}\sec(ax)\tan(ax) + \frac{1}{2a}\ln\left|\sec(ax) + \tan(ax)\right| + C$$

29. $$\int \csc^3(ax)\,dx = \frac{-1}{2a}\csc(ax)\cot(ax) - \frac{1}{2a}\ln\left|\csc(ax) + \cot(ax)\right| + C$$

30. $$\int \sin(ax)\sin(bx)\,dx = \frac{1}{2(a-b)}\sin((a-b)x) - \frac{1}{2(a+b)}\sin((a+b)x) + C,\ |a| \neq |b|$$

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31. $$\int \cos(ax)\cos(bx)\,dx = \frac{1}{2(a-b)}\sin((a-b)x) + \frac{1}{2(a+b)}\sin((a+b)x) + C,\ |a| \neq |b|$$

32. $$\int \sin(ax)\cos(bx)\,dx = \frac{-1}{2(a-b)}\cos((a-b)x) - \frac{1}{2(a+b)}\cos((a+b)x) + C,\ |a| \neq |b|$$

Part Three: Integrals Involving Exponential & Logarithmic Functions

33. $$\int e^{ax}dx = \frac{1}{a}e^{ax} + C$$

34. $$\int b^{ax}dx = \frac{1}{a\ln b}b^{ax} + C$$

35. $$\int xe^{ax}dx = \frac{1}{a}xe^{ax} - \frac{1}{a^2}e^{ax} + C$$

36. $$\int x^2e^{ax}dx = \frac{1}{a}x^2e^{ax} - \frac{2}{a^2}xe^{ax} + \frac{2}{a^3}e^{ax} + C$$

37. $$\int \ln x\,dx = x\ln x - x + C$$

38. $$\int x^n \ln x\,dx = \frac{1}{n+1}x^{n+1}\ln x - \frac{1}{(n+1)^2}x^{n+1} + C,\ n \neq -1$$

39. $$\int x^{-1}\ln x\,dx = \int \ln x \cdot \frac{1}{x}dx = \frac{1}{2}(\ln x)^2 + C$$

40. $$\int \frac{1}{x\ln x}dx = \ln|\ln x| + C$$

41. $$\int e^{ax}\sin(bx)\,dx = \frac{e^{ax}}{a^2+b^2}[a\sin(bx) - b\cos(bx)] + C$$

42. $$\int e^{ax}\cos(bx)\,dx = \frac{e^{ax}}{a^2+b^2}[a\cos(bx) + b\sin(bx)] + C$$

Part Four: Integrals Involving $a^2 \pm x^2$ and $x^2 \pm a^2$

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

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

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45. $$\int \frac{1}{|x|\sqrt{x^2-a^2}}dx = \frac{1}{a}\operatorname{arcsec}\left(\frac{x}{a}\right)+C$$

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

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

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

49. $$\int x^2\sqrt{x^2\pm a^2}dx = \frac{1}{8}x\left(2x^2\pm a^2\right)\sqrt{x^2\pm a^2} - \frac{1}{8}a^4\ln\left|x+\sqrt{x^2\pm a^2}\right|+C$$