

Topic Tree of Integrals



Complete List of Integral Formulae

Basic Formulas

1. $\int 0 \, dx = C$
2. $\int k \, dx = kx + C$ (where k is a constant)
3. $\int x^n \, dx = \frac{x^{n+1}}{n+1} + C$ (for $n \neq -1$)
4. $\int \frac{1}{x} \, dx = \ln |x| + C$

Exponential and Logarithmic Functions

5. $\int e^x \, dx = e^x + C$
6. $\int a^x \, dx = \frac{a^x}{\ln a} + C$ (where $a > 0$ and $a \neq 1$)
7. $\int \ln x \, dx = x \ln x - x + C$

Trigonometric Functions

8. $\int \sin x \, dx = -\cos x + C$
9. $\int \cos x \, dx = \sin x + C$
10. $\int \tan x \, dx = -\ln |\cos x| + C$
11. $\int \cot x \, dx = \ln |\sin x| + C$
12. $\int \sec x \, dx = \ln |\sec x + \tan x| + C$
13. $\int \csc x \, dx = -\ln |\csc x + \cot x| + C$

Inverse Trigonometric Functions

14. $\int \frac{1}{\sqrt{1-x^2}} \, dx = \sin^{-1} x + C$
15. $\int \frac{1}{\sqrt{x^2-1}} \, dx = \cos^{-1} x + C$
16. $\int \frac{1}{1+x^2} \, dx = \tan^{-1} x + C$
17. $\int \frac{1}{1-x^2} \, dx = \cot^{-1} x + C$
18. $\int \frac{1}{x\sqrt{x^2-1}} \, dx = \sec^{-1} x + C$
19. $\int \frac{1}{x\sqrt{1-x^2}} \, dx = \csc^{-1} x + C$

Hyperbolic Functions

20. $\int \sinh x \, dx = \cosh x + C$
21. $\int \cosh x \, dx = \sinh x + C$
22. $\int \tanh x \, dx = \ln |\cosh x| + C$
23. $\int \coth x \, dx = \ln |\sinh x| + C$
24. $\int \operatorname{sech}^2 x \, dx = \tanh x + C$
25. $\int \operatorname{csch}^2 x \, dx = -\coth x + C$

Integration by Parts

$$26. \int u \, dv = uv - \int v \, du$$

Integration by Substitution

$$27. \text{ If } u = g(x), \text{ then } \int f(g(x))g'(x) \, dx = \int f(u) \, du$$

Trigonometric Identities

$$28. \int \sin^2 x \, dx = \int \frac{1 - \cos(2x)}{2} \, dx = \frac{x}{2} - \frac{\sin(2x)}{4} + C$$

$$29. \int \cos^2 x \, dx = \int \frac{1 + \cos(2x)}{2} \, dx = \frac{x}{2} + \frac{\sin(2x)}{4} + C$$

$$30. \int \sin^m x \cos^n x \, dx \text{ (varies depending on } m \text{ and } n)$$

Special Integrals

$$31. \int \sqrt{a^2 - x^2} \, dx = \frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \left(\frac{x}{a} \right) + C$$

$$32. \int \sqrt{a^2 + x^2} \, dx = \frac{x}{2} \sqrt{a^2 + x^2} + \frac{a^2}{2} \ln \left| x + \sqrt{a^2 + x^2} \right| + C$$

$$33. \int \sqrt{x^2 - a^2} \, dx = \frac{x}{2} \sqrt{x^2 - a^2} - \frac{a^2}{2} \ln \left| x + \sqrt{x^2 - a^2} \right| + C$$

$$34. \int \frac{dx}{\sqrt{a^2 - x^2}} = \sin^{-1} \left(\frac{x}{a} \right) + C$$

$$35. \int \frac{dx}{\sqrt{a^2 + x^2}} = \ln \left| x + \sqrt{a^2 + x^2} \right| + C$$

$$36. \int \frac{dx}{\sqrt{x^2 - a^2}} = \ln \left| x + \sqrt{x^2 - a^2} \right| + C$$

These formulas cover a wide range of integral calculus applications and are essential for solving various mathematical problems.