

Class 12 Integration Methods Cheat Sheet

NCERT Class 12 Mathematics, Chapter 7 (Integrals) · CBSE 2026-27

Step 1: Choose the method

What you see	Method
A function and its derivative together	Substitution
A function inside another function (with its inner derivative outside)	Substitution
Product of two different types of function ($x \cos x$, $x^2 e^x$)	By parts (use ILATE)
$\log x$ or $\tan^{-1}x$ on its own	By parts, second function = 1
$e^x[f(x) + f'(x)]$	Answer directly: $e^x f(x) + C$
Rational function, denominator factorises	Partial fractions
Numerator degree $\geq$ denominator degree	Divide first, then partial fractions
Quadratic in the denominator / under a root	Complete the square $\rightarrow$ standard form

Standard integrals

Integral	Result
$\int x^n dx$ ($n \neq -1$)	$x^{n+1}/(n+1) + C$
$\int dx/x$	$\log x + C$
$\int e^x dx$	$e^x + C$
$\int a^x dx$	$a^x/\log a + C$
$\int \sin x dx$	$-\cos x + C$
$\int \cos x dx$	$\sin x + C$
$\int \sec^2 x dx$	$\tan x + C$
$\int \operatorname{cosec}^2 x dx$	$-\cot x + C$
$\int \tan x dx$	$\log \sec x + C$
$\int \cot x dx$	$\log \sin x + C$
$\int \sec x dx$	$\log \sec x + \tan x + C$
$\int \operatorname{cosec} x dx$	$\log \operatorname{cosec} x - \cot x + C$
$\int dx/(x^2 + a^2)$	$(1/a) \tan^{-1}(x/a) + C$
$\int dx/(x^2 - a^2)$	$(1/2a) \log (x-a)/(x+a) + C$
$\int dx/(a^2 - x^2)$	$(1/2a) \log (a+x)/(a-x) + C$
$\int dx/\sqrt{a^2 - x^2}$	$\sin^{-1}(x/a) + C$
$\int dx/\sqrt{x^2 \pm a^2}$	$\log x + \sqrt{x^2 \pm a^2} + C$
$\int \sqrt{a^2 - x^2} dx$	$(x/2)\sqrt{a^2 - x^2} + (a^2/2) \sin^{-1}(x/a) + C$
$\int \sqrt{x^2 \pm a^2} dx$	$(x/2)\sqrt{x^2 \pm a^2} \pm (a^2/2) \log x + \sqrt{x^2 \pm a^2} + C$

Integration by parts

$$\int f(x) g(x) dx = f(x) \int g(x) dx - \int [f'(x) \int g(x) dx] dx$$

Choose f (the first function) using **ILATE**: Inverse trigonometric $\rightarrow$ Logarithmic $\rightarrow$ Algebraic $\rightarrow$ Trigonometric $\rightarrow$ Exponential. Pick whichever comes first — but the real test is that the second integral gets simpler.

$$\text{Shortcut: } \int e^x [f(x) + f'(x)] dx = e^x f(x) + C$$

Partial fraction forms

Denominator	Write the fraction as
$(x - a)(x - b)$	$A/(x - a) + B/(x - b)$
$(x - a)^2$	$A/(x - a) + B/(x - a)^2$
$(x - a)(x - b)(x - c)$	$A/(x - a) + B/(x - b) + C/(x - c)$
$(x - a)^2(x - b)$	$A/(x - a) + B/(x - a)^2 + C/(x - b)$
$(x - a)(x^2 + bx + c)$, quadratic not factorisable	$A/(x - a) + (Bx + C)/(x^2 + bx + c)$

Find constants fast: put x equal to each root of the denominator ("cover-up"), then compare coefficients for any left over. Remember: $\int B/(x - a)^2 dx = -B/(x - a) + C$, not a log.

Sign-error checklist

- ☐ $\int \sin x dx = -\cos x$ (and $-\int \sin x dx = +\cos x$)
- ☐ Bracket the whole second integral in by parts before simplifying
- ☐ Carry constants through dt (e.g. $dt = -2e^{-2x} dx$)
- ☐ $\log|x|$ — keep the modulus
- ☐ $+ C$ for indefinite integrals; change the limits for definite ones
- ☐ Check: differentiate your answer — you should get the integrand back