

Integration Formulas

A complete, exam-ready reference for JEE & Board Mathematics — includes algebraic, trigonometric, inverse trigonometric, integration by parts and definite integral formulas.

1 Basic Algebraic Integration Formulas

Function	Integral Formula
x^n	$\int x^n dx = \frac{x^{n+1}}{n+1} + C \quad (n \neq -1)$
$1/x$	$\int \frac{1}{x} dx = \ln x + C$
1 (constant)	$\int 1 dx = x + C$
a (constant)	$\int a dx = ax + C$
e^x	$\int e^x dx = e^x + C$
a^x	$\int a^x dx = \frac{a^x}{\ln a} + C$

2 Trigonometric Integration Formulas

The integral formulas for trigonometric functions in this integration formula list are used constantly in JEE and board numericals involving periodic functions.

Function	Integral Formula
$\sin x$	$\int \sin x dx = -\cos x + C$
$\cos x$	$\int \cos x dx = \sin x + C$
$\sec^2 x$	$\int \sec^2 x dx = \tan x + C$
$\csc^2 x$	$\int \csc^2 x dx = -\cot x + C$
$\sec x \tan x$	$\int \sec x \tan x dx = \sec x + C$
$\csc x \cot x$	$\int \csc x \cot x dx = -\csc x + C$
$\tan x$	$\int \tan x dx = \ln \sec x + C$
$\cot x$	$\int \cot x dx = \ln \sin x + C$
$\sec x$	$\int \sec x dx = \ln \sec x + \tan x + C$
$\csc x$	$\int \csc x dx = \ln \csc x - \cot x + C$

3 Inverse Trigonometric Integral Formulas

Inverse trigonometric integral formulas are one of the most tested parts of the integration formula list, since they involve recognisable square-root and quadratic patterns.

Standard Form	Integral Formula
$\frac{1}{\sqrt{a^2-x^2}}$	$\int \frac{dx}{\sqrt{a^2-x^2}} = \sin^{-1}(x/a) + C$
$\frac{1}{a^2+x^2}$	$\int \frac{dx}{a^2+x^2} = \frac{1}{a} \tan^{-1}(x/a) + C$
$\frac{1}{x\sqrt{x^2-a^2}}$	$\int \frac{dx}{x\sqrt{x^2-a^2}} = \frac{1}{a} \sec^{-1}(x/a) + C$
$\frac{1}{\sqrt{x^2-a^2}}$	$\int \frac{dx}{\sqrt{x^2-a^2}} = \ln x + \sqrt{x^2-a^2} + C$
$\frac{1}{\sqrt{x^2+a^2}}$	$\int \frac{dx}{\sqrt{x^2+a^2}} = \ln x + \sqrt{x^2+a^2} + C$

$$\frac{1}{a^2 - x^2}$$

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

4 Integration by Parts

Integration by parts is used when the integrand is a product of two functions, and it is one of the most important tools beyond the basic integral formulas list:

$$\int u \cdot v \, dx = u \int v \, dx - \int \left(\frac{du}{dx} \int v \, dx \right) dx$$

The choice of **u** and **v** follows the **ILATE rule** (Inverse, Logarithmic, Algebraic, Trigonometric, Exponential), which decides the order of preference for selecting the first function u. This is one of the most frequently tested concepts in JEE Main Chapterwise PYQs.

5 Indefinite vs. Definite Integration Formulas

While the integration formulas listed above give indefinite integrals (a family of functions plus C), definite integration formulas evaluate this antiderivative between two limits:

$$\int_a^b f(x) \, dx = F(b) - F(a)$$

Property	Formula
Reversal of limits	$\int_a^b f(x) \, dx = -\int_b^a f(x) \, dx$
Splitting the interval	$\int_a^b f(x) \, dx = \int_a^c f(x) \, dx + \int_c^b f(x) \, dx$
King's property	$\int_a^b f(x) \, dx = \int_a^b f(a+b-x) \, dx$
Even function	$\int_{-a}^a f(x) \, dx = 2 \int_0^a f(x) \, dx$ if $f(-x) = f(x)$
Odd function	$\int_{-a}^a f(x) \, dx = 0$ if $f(-x) = -f(x)$

These properties — especially King's Property and the even/odd function shortcuts — appear repeatedly in JEE Advanced Chapterwise PYQs, often disguised inside trigonometric or rational integrands.

Compiled by the eSara! academic team as a companion to the full article, *Integration Formulas — Complete List with Examples*, at esara!l.com/integration-formulas. For step-by-step derivations, solved examples and practice questions, visit the blog.