EngineeringRise

Indefinite integrals and methods

Formulas and units, JEE Main. Status: Reviewed on 2026-11-20.

Result	Formula	Units or note
Power rule	integral of x^n dx = x^(n+1)/(n+1) + C (n not equal to -1) Valid when: n not equal to -1	units of the integrand times the variable
Reciprocal	integral of 1/x dx = ln|x| + C Valid when: x not equal to 0	dimensionless
Exponential	integral of e^x dx = e^x + C; integral of a^x dx = a^x/ln a + C Valid when: a > 0 and a not equal to 1 for the second form	units of the integrand times the variable
Trigonometric	integral of sin x = -cos x; cos x = sin x; sec^2 x = tan x; tan x = ln|sec x|; sec x = ln|sec x + tan x| Valid when: x where the function is defined; x in radians	dimensionless (x in radians)
Rational standard forms	1/(x^2 + a^2) gives (1/a) arctan(x/a); 1/(x^2 - a^2) gives (1/(2a)) ln|(x - a)/(x + a)| Valid when: a > 0; log form needs x not equal to plus or minus a	dimensionless when x and a share a unit
Radical standard forms	1/sqrt(a^2 - x^2) gives arcsin(x/a); sqrt(a^2 - x^2) gives (x/2) sqrt(a^2 - x^2) + (a^2/2) arcsin(x/a) Valid when: a > 0 and |x| < a	dimensionless for arcsin; length squared for the second form
By parts	integral of u v dx = u times integral of v dx - integral of [u-prime times integral of v dx] dx Valid when: u and v differentiable, integral of v dx known	units of u times v times the variable
e^x pattern	integral of e^x [f(x) + f-prime(x)] dx = e^x f(x) + C Valid when: f differentiable; the bracket has the form f + f'	units of the integrand times the variable
Linear argument	integral of f(ax + b) dx = F(ax + b)/a + C Valid when: a not equal to 0; F is an antiderivative of f	units of the integrand times the variable
Quadratic denominator	1/(x^2 + b x + c): complete the square, then use (1/a) arctan(u/a) or (1/(2a)) ln|(u - a)/(u + a)| with u = x + b/2 Valid when: quadratic with no real roots gives arctan, real roots give log	function of x
Linear-over-quadratic	(p x + q)/(a x^2 + b x + c): write p x + q = (p/(2a))(2a x + b) + [q - p b/(2a)]; log part plus standard form Valid when: a not equal to 0; denominator quadratic	function of x
Logarithm	integral of ln x dx = x ln x - x + C (by parts, u = ln x, v = 1) Valid when: x > 0	function of x

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/integral-calculus/indefinite-integrals-and-methods

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