EngineeringRise

Order, degree and separation of variables

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

Result	Formula	Units or note
Order	order of the highest derivative present	positive integer
Degree	exponent of the highest derivative after clearing radicals Valid when: equation polynomial in its derivatives after clearing radicals	positive integer
Arbitrary constants	independent constants in the general solution = order Valid when: general solution of an nth-order ODE; constants independent	count
Separable form	dy/dx = f(x) g(y) -> dy/g(y) = f(x) dx Valid when: variables separable: right side is f(x) times g(y)	n/a (as in the equation)
Growth or decay	dN/dt = k N -> N = N0 e^(k t) Valid when: rate of change proportional to current amount, k constant	N in its own unit; k per unit time
Newton cooling	T - Ts = (T0 - Ts) e^(-k t) Valid when: cooling rate proportional to gap from constant surroundings temp Ts	temperature; k per unit time
Standard integrals	dy/y = ln|y|; dy/y^2 = -1/y; dy/(1 + y^2) = arctan y Valid when: integrate with a constant; y not 0 for dy/y, y not 0 for dy/y^2	dimensionless
Partial fractions	1/(y (2 - y)) = (1/2)(1/y + 1/(2 - y)) Valid when: algebraic identity for y not equal to 0 or 2	dimensionless

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/differential-equations/order-degree-and-separation-of-variables

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