EngineeringRise

Parabola, ellipse and hyperbola in standard forms

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

Result	Formula	Units or note
Parabola y^2 = 4ax	focus (a, 0); directrix x = -a; latus rectum 4a Valid when: parabola y^2 = 4ax with a > 0 (opens right), vertex at origin	length
Parabola parametric point and focal distance	(a t^2, 2 a t); SP = x1 + a Valid when: point on y^2 = 4ax; S is the focus (a, 0)	length
Focal chord of a parabola	other end t' = -1/t; length a (t + 1/t)^2 = x1 + x2 + 2a Valid when: chord through the focus of y^2 = 4ax; t is the parameter	length
Ellipse x^2/a^2 + y^2/b^2 = 1 (a > b)	b^2 = a^2 (1 - e^2); foci (+-ae, 0); directrices x = +-a/e Valid when: standard ellipse centred at origin with a > b	length
Ellipse latus rectum and focal sum	2b^2/a; SP + S'P = 2a Valid when: standard ellipse with a > b; S, S' are the foci	length
Hyperbola x^2/a^2 - y^2/b^2 = 1	b^2 = a^2 (e^2 - 1); foci (+-ae, 0); directrices x = +-a/e Valid when: standard hyperbola with transverse axis along x	length
Hyperbola latus rectum and focal difference	2b^2/a; |SP - S'P| = 2a Valid when: standard hyperbola; S, S' foci, P on the curve	length
Hyperbola asymptotes	y = +-(b/a) x Valid when: hyperbola x^2/a^2 - y^2/b^2 = 1 centred at origin	dimensionless
Eccentricity	ellipse: e = c/a < 1; parabola: e = 1; hyperbola: e = c/a > 1 Valid when: standard-form conic; c is the centre-to-focus distance	dimensionless
Chord of a conic cut by y = m x + c	sqrt(1 + m^2) |x1 - x2| Valid when: non-vertical line; x1, x2 are x-roots of the intersection	length

Full lesson with worked examples:
https://www.engineeringrise.in/learn/learn/jee-main/mathematics/coordinate-geometry/parabola-ellipse-and-hyperbola-in-standard-fo

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