

Conic Sections

CBSE Class 11 Maths · Knowledge organiser

KEY DEFINITIONS

Conic section

A curve made by cutting a double cone with a plane: circle, ellipse, parabola or hyperbola.

Focus and directrix

A parabola is the set of points equidistant from a fixed point (focus) and a fixed line (directrix).

Eccentricity

$e = c/a$, which measures how stretched a conic is.

KEY FORMULAS

Circle, centre

$$(h, k) \quad (x - h)^2 + (y - k)^2 = r^2$$

$$x^2 + y^2 + 2gx + 2fy + c = 0 \text{ centre } (-g, -f), r = \sqrt{g^2 + f^2 - c}$$

Parabola $y^2 = 4ax$ focus $(a, 0)$, directrix $x = -a$, LR $4a$

Ellipse

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, a > b \quad c^2 = a^2 - b^2, e = \frac{c}{a} < 1, \text{ LR } \frac{2b^2}{a}$$

Hyperbola

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1 \quad c^2 = a^2 + b^2, e = \frac{c}{a} > 1, \text{ LR } \frac{2b^2}{a}$$

YOU SHOULD BE ABLE TO...

- Read centre and radius, and foci, vertices, eccentricity and latus rectum from standard equations.
- Write the equation of a circle, parabola, ellipse or hyperbola from given features.
- Analyse a conic fully, including chords, tangency to axes and the focus property in applications.
- Find a conic from points on it and use the defining distance properties.

WORKED EXAMPLE

Find the centre and radius of $x^2 + y^2 + 8x - 2y - 8 = 0$.

$(x + 4)^2 + (y - 1)^2 = 25$: centre $(-4, 1)$, radius 5.

COMMON MISTAKES

- ✗ $c^2 = a^2 + b^2$ for an ellipse, or $c^2 = a^2 - b^2$ for a hyperbola: they are the other way round.
- ✗ Reading a from $4a$: in $y^2 = 12x$, $a = 3$, not 12.
- ✗ Placing the foci on the wrong axis: they lie on the axis of the larger denominator (ellipse) or of the positive term (hyperbola).
- ✗ Radius from the general form without the square root, or with the sign of c wrong.