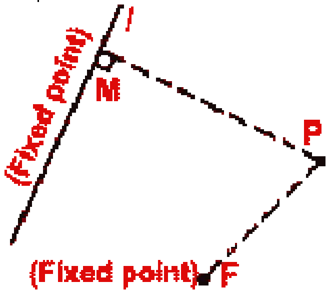
CONIC SECTION FORMULAS CLASS XI

Let l be a fixed line and F be a fixed point not on l, and $e > 0$ be a fixed real number. Let |MP| be the perpendicular distance from a point P (in the plane of the line l and point F) to the line l, then the locus of all points P such that |FP| = e |MP| is called a *conic*.



The fixed point F is called a **focus** of the conic and the fixed line l is called the **directrix** associated with F. The fixed real number e (> 0) is called eccentricity of the conic.
In particular, a conic with eccentricity e is called
(i) a **parabola** iff e = 1 (ii) an **ellipse** iff e < 1 (iii) a **hyperbola** iff e > 1.

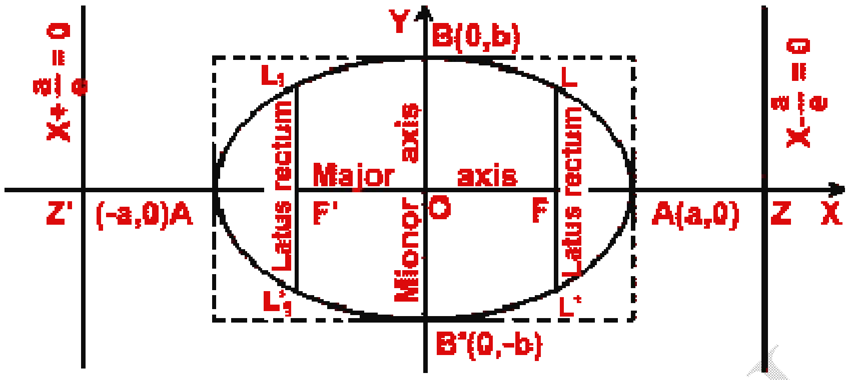
Main facts about the parabola

Equations	**$y^2= 4ax$,(a>0) Right hand**	**$y^2 = -4ax$,a>0 Left hand**	**$x^2 = 4ay$,a>0 Upwards**	**$x^2 = -4ay$,a>0 Downwards**
Axis	y=0	y = 0	x = 0	x = 0
Eqn. of Directrix	x +a = 0	x -a = 0	y +a = 0	y -a = 0
Focus	(a, 0)	(– a, 0)	(0,a)	(0, – a)
Vertex	(0,0)	(0,0)	(0,0)	(0,0)
Length of Latus-rectum	4a	4a	4a	4a

Main facts about the ellipse

Equation	**$x^2/a^2 + y^2/b^2 = 1$ (a > b)**	**$x^2/a^2 + y^2/b^2 = 1$ (a < b)**
Eccentricity	$b^2 = a^2 (1 – e^2)$	$a^2 = b^2 (1 – e^2)$
Equation of major axis	y = 0	x = 0
Length of major axis	2a	2b
Equation of minor axis	x = 0	y = 0
length of minor axis	2b	2a
Vertices	(± a,0)	(0, ± b)
Foci	(± ae, 0)	(0, ± be)
Equation of Directrices	x = ± a/e	y = ± b/e
Length of Latus -rectum	$2b^2/a$	$2a^2/b$

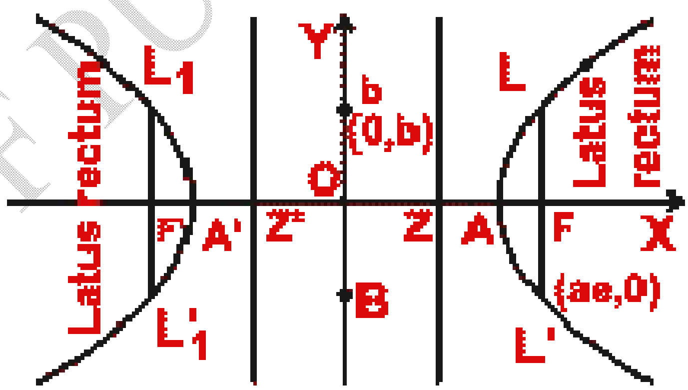
Ellipse →



Main facts about the hyperbola

Equation	$x^2/a^2 - y^2/b^2 = 1$ **a > 0, b > 0**	$x^2/a^2 - y^2/b^2 = -1$ **a > 0, b > 0**
Eccentricity	$b^2 = a^2(e^2 - 1)$	$a^2 = b^2(e^2 - 1)$
Equation of transverse axis	$y = 0$	$x = 0$
Length of transverse axis	2a	2b
Equation of conjugate axis	$x = 0$	$y = 0$
Length of conjugate axis	2b	2a
Vertices	$(\pm a, 0)$	$(0, \pm b)$
Foci	$(\pm ae, 0)$	$(0, \pm be)$
Equation of Directrices	$x = \pm a/e$	$y = \pm b/e$
Length of lactus-rectum	$2b^2/a$	$2a^2/b$

Hyperbola →



Main facts about the Circle

1. The equation of a circle with C(a,b) as center and r (>0) as radius is given by
$(x - a)^2 + (y - b)^2 = r^2$

2. The equation $x^2 + y^2 + 2gx + 2fy + c = 0$ represents a circle iff $g^2 + f^2 - c > 0$.

Its center is $(-g, -f)$ and radius = $\sqrt{[g^2 + f^2 - c]}$