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CONIC SECTIONS

1 OMQ + 1 VSAQ + 1 SAQ + 1 LAQ [1 M + 2M+4M +8 M = 15 M]

CONCEPTS & FORMULAS

1) CIRCLE

Circle: A circle is the set of all points in a plane that are equidistant from a fixed point.

- The equation of the circle in the **standard form** is $x^2 + y^2 = r^2$
- The equation of the circle with centre (h,k) , radius r is $(x-h)^2 + (y-k)^2 = r^2$
- The equation of the circle in the **general form** is $x^2 + y^2 + 2gx + 2fy + c = 0$.

Centre $C = (-g, -f)$; radius $r = \sqrt{g^2 + f^2 - c}$

2) PARABOLA

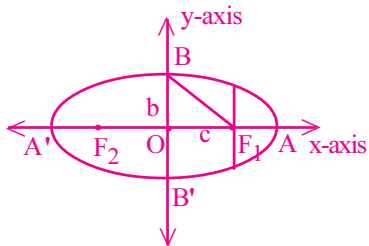
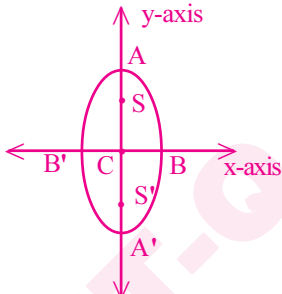
Parabola: A parabola is the set of all points in a plane that are equidistant from a fixed line and a fixed point in the plane. Parabola is a conic with eccentricity $e=1$.

FOUR STANDARD FORMS OF PARABOLA

$y^2 = 4ax$ (Horizontal right side)	$x^2 = 4ay$ (Vertical upward)	$y^2 = -4ax$ (Horizontal left side)	$x^2 = -4ay$ (Vertical downward)
1) Focus $F = (a, 0)$ 2) Vertex $A = (0, 0)$ 3) Equation of the directrix is $x = -a$ 4) Equation of the latusrectum is $x = a$ 5) Equation of the axis is $y = 0$	1) Focus $F = (0, a)$ 2) Vertex $A = (0, 0)$ 3) Equation of the directrix is $y = -a$ 4) Equation of the latusrectum is $y = a$ 5) Equation of the axis is $x = 0$	1) Focus $F = (-a, 0)$ 2) Vertex $A = (0, 0)$ 3) Equation of the directrix is $x = a$ 4) Equation of the latusrectum is $x = -a$ 5) Equation of the axis is $y = 0$	1) Focus $F = (0, -a)$ 2) Vertex $A = (0, 0)$ 3) Equation of the directrix is $y = a$ 4) Equation of the latusrectum is $y = -a$ 5) Equation of the axis is $x = 0$

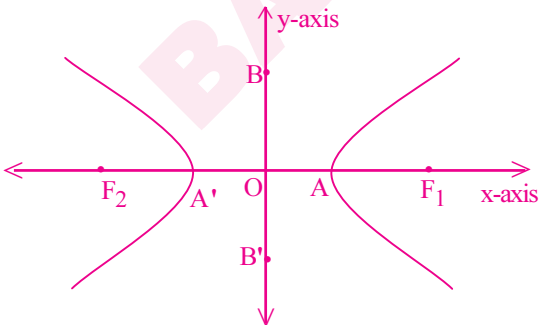
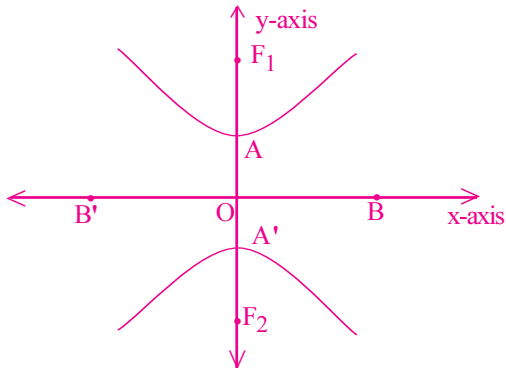
3) ELLIPSE

Ellipse : An ellipse is the set of all points in a plane the sum of whose distances from two fixed points in the plane is a constant. Ellipse is a conic with eccentricity $e < 1$.

HORIZONTAL ELLIPSE (Foci on x-axis) $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1, \quad a > b$	VERTICAL ELLIPSE (Foci on y-axis) $\frac{x^2}{b^2} + \frac{y^2}{a^2} = 1, \quad b < a$
 1) Eccentricity $e = \frac{c}{a}, c^2 = a^2 - b^2$. 2) Foci $(\pm c, 0)$ 3) Vertices $(\pm a, 0)$ 4) Length of Latusrectum $= 2b^2/a$ 5) Length of Major axis $= 2a$, Minor axis $= 2b$	 1) Eccentricity $e = \frac{c}{a}, c^2 = a^2 - b^2$. 2) Foci $(0, \pm c)$ 3) Vertices $(0, \pm a)$ 4) Length of Latusrectum $= 2b^2/a$ 5) Length of Major axis $= 2a$, Minor axis $= 2b$

4) HYPERBOLA

Hyperbola: A hyperbola is the set of all points in a plane the difference of whose distances from two fixed points in the plane is a constant. Hyperbola is a conic with eccentricity $e > 1$.

Hyperbola with foci on x-axis $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$	Hyperbola with foci on y-axis $\frac{y^2}{a^2} - \frac{x^2}{b^2} = 1$
 1) Eccentricity $e = \frac{c}{a}, c^2 = a^2 + b^2$. 2) Foci $(\pm c, 0)$ 3) Vertices $(\pm a, 0)$ 4) Length of Latusrectum $= 2b^2/a$ 5) Length of Trans. axis $= 2a$, Conj. axis $= 2b$	 1) Eccentricity $e = \frac{c}{a}, c^2 = a^2 + b^2$. 2) Foci $(0, \pm c)$ 3) Vertices $(0, \pm a)$ 4) Length of Latusrectum $= 2b^2/a$ 5) Length of Trans. axis $= 2a$, Conj. axis $= 2b$