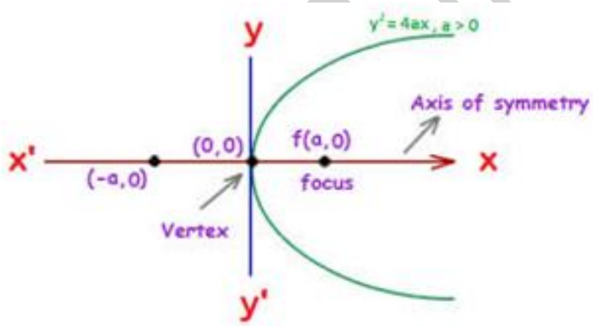
- The general equation of a conic is $ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$. Here if $e = 1$ and $D \neq 0$, then it represents a parabola.
- The general equation of parabola is $(y-y_0)^2 = (x-x_0)$, which has its vertex at (x_0, y_0).
- The general equation of parabola with vertex at (0, 0) is given by $y^2 = 4ax$, and it opens rightwards.
- The parabola$x^2 = 4ay$ opens upwards.
- The equation $y^2 = 4ax$ is considered to be the standard equation of the parabola for which the various components are
  1. Vertex at (0,0)
  2. Directrix is $x+a = 0$
  3. Axis is $y = 0$
  4. Focus is (a, 0)
  5. Length of latus rectum = 4a
  6. Ends of latus rectum are L(a, 2a) and L'(a, -2a)



- *The parabola $y = a(x-h)^2 + k$has its vertex at (h, k)*
- The perpendicular distance from focus on directrix is half the length of latus rectum
- Vertex is the middle point of the focus and the point of intersection of directrix and axis
- Two parabolas are said to be equal if they have the same latus rectum
- The point (x_1, y_1) lies outside, on or inside the parabola$y^2 = 4ax$, according as the expression $y_1^2 = 4ax_1$ is positive, zero or negative.
- Length of the chord intercepted by the parabola on the line $y = mx + c$ is $(4/m^2) \sqrt{a(1+m^2)(a-mc)}$
- Length of the focal chord which makes an angle δ with the x-axis is $4a \operatorname{cosec}^2\delta$
- In parametric form, the parabola is represented by the equations $x = at^2$ and $y = 2at$
- The equation of a chord joining t_1 and t_2 is given by $2x - (t_1 + t_2)y + 2at_1t_2 = 0$
- If a chord joining t_1, t_2 and t_3, t_4 pass through a point (c, 0) on the axis, then $t_1t_2 = t_3t_4 = -c/a$
- Tangents to the parabola $y^2 = 4ax$
  1. $yy_1 = 2a(x+x_1)$ at the point (x_1, y_1)
  2. $y = mx + a/m$ ($m \neq 0$) at $(a/m^2, 2a/m)$
  3. $ty = x+at^2$ at $(at^2, 2at)$
- Normals to the parabola $y^2 = 4ax$
  1. $y-y_1 = -y_1/ 2a(x-x_1)$ at the point (x_1, y_1)
  2. $y = mx - 2am - am^3$ at $(am^2, -2am)$
  3. $y + tx = 2at + at^3$ at $(at^2, 2at)$
- The equation of the director circle to the parabola is $x + a = 0$ which is same as the equation of the directrix
- The circle circumscribing the triangle formed by any three tangents to a parabola passes through the focus.

- The orthocenter of any triangle formed by three tangents to a parabola $y^2 = 4ax$ lies on then directrix and has the coordinates $–a, a(t_1 + t_2 + t_3 + t_1t_2t_3)$.
- The area of the triangle formed by three points on a parabola is twice the area of the triangle formed by the tangents at these points.
- A circle circumscribing the triangle formed by three co-normal points passes through the vertex of the parabola and its equation is given by $2(x^2 + y^2)– 2(h+2a)x - ky =0$

The two vital parabolas along with their basic components like vertex and directrix are tabulated below:

Form of the parabola	**$y^2 = 4ax$ (Horizontal)**	**$x^2 = 4by$ (Vertical)**
Vertex	(0, 0)	(0, 0)
Focus	(a, 0)	(0, b)
Equation of the **Directrix**:	$x = -a$	$y = -b$
Equation of the axis:	$y = 0$	$x = 0$
Tangent at the vertex:	$x = 0$	$y = 0$
Equation of **latus rectum**	$x = 0$	$y = b$
Length of **latus rectum**	$\|4a\|$	$\|4b\|$
End points of **latus rectum**	(a, 2a) & (a, – 2a)	(2b, b) & (–2b, b)