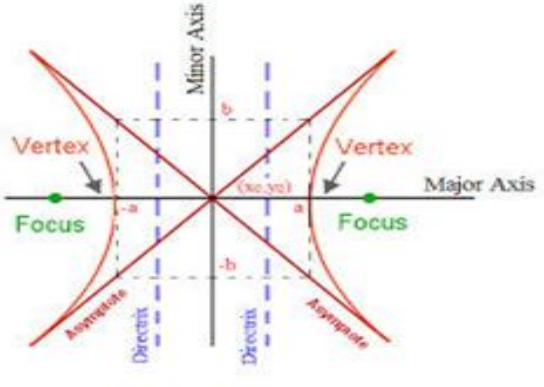
- The standard equation of hyperbola with reference to its principal axis along the coordinate axis is given by $x^2/a^2 - y^2/b^2 = 1$, where $b^2 = a^2 (e^2 -1)$
- The foci of the hyperbola are S(ae, 0) and S' = (-ae, 0)
- Equations of the directrices are given by $x = a/e$ and $x = -a/e$
- The coordinates of vertices are A' = (-a, 0) and A = (a,0)
- The length of latus rectum is $2b^2/a = 2a(e^2 - 1)$
- The length of the transverse axis of the hyperbola is 2a.
- The difference of the focal distances of any point on the hyperbola is constant and is equal to transverse axis.
- $x^2/a^2 - y^2/b^2 = 1$ and $-x^2/a^2 + y^2/b^2 = 1$ are conjugate hyperbola of each other.
- If e_1 and $e_2$are the eccentricities of the hyperbola and its conjugate then $e_1^{-2} + e_2^{-2} = 1$
- The foci of a hyperbola and its conjugate are concyclic and form the vertices of a square.
- The length of the transverse axis of a hyperbola is 2a and the transverse axis and conjugate axis together constitute the principal axis of the hyperbola.
- Whether two hyperbolas are similar or not is decided on the basis of their eccentricity. The hyperbolas with same eccentricity are same.
- The eccentricity of rectangular hyperbola is √2 and the length of its latus rectum is equal to its transverse or conjugate axis.
- The equation of the auxiliary circle of the hyperbola is given by $x^2 + y^2 = a^2$
- In parametric form, the equations $x = a \sec\theta$ and $y = b \tan\theta$ together represent the hyperbola $x^2/a^2 - y^2/b^2 = 1$. Here θ is a parameter.



- The point $P(x_1, y_1)$ lies within, on or outside the ellipse according as $x_1^2/a^2 - y_1^2/b^2 = 1$ is positive, zero or negative.
- The line $y = mx + c$ is a secant, a tangent or passes outside the hyperbola $x^2/a^2 - y^2/b^2 = 1$ according as whether c^2 is > = or < $a^2m^2 - b^2$

Equations of tangents

- Equation of tangent to hyperbola $x^2/a^2 - y^2/b^2 = 1$at the point (x_1, y_1) is $xx_1/a^2 - yy_1/b^2 = 1$
- Equation of tangent to hyperbola $x^2/a^2 - y^2/b^2 = 1$at the point (a sec θ, b tan θ) is $(x \sec\theta)/a - (y \tan\theta)/b = 1$
- $y = mx \pm[(a^2m^2 - b^2]$ can also be taken as the tangent to the hyperbola $x^2/a^2 - y^2/b^2 = 1$

Equations of normal

- Equation of normal to the hyperbola $x^2/a^2 - y^2/b^2 = 1$ at the point (x_1, y_1) is $a^2 x/x_1 + b^2 y/y_1 = a^2 - b^2 = a^2e^2$
- Equation of normal at the point P(a sec θ, b tan θ) on the hyperbola $x^2/a^2 - y^2/b^2 = 1$ is $ax/\sec\theta + by/\tan\theta = a^2+b^2 = a^2e^2$

- The equation of director circle is $x^2 + y^2 = a^2 - b^2$
- The equations of the asymptotes of the hyperbola are $x/a + y/b = 0$ and $x/a - y/b = 0$. This can be combined as $x^2/a^2 - y^2/b^2 = 0$
- The asymptotes of the hyperbola and its conjugate are same
- The asymptotes pass through the center of the hyperbola and the bisectors of the angles between the asymptotes are the axis of a hyperbola
- The equation $xy = c^2$ represents a rectangular hyperbola
    1. ü In a hyperbola $b^2 = a^2 (e^2 – 1)$. In the case of rectangular hyperbola (i.e., when b = a) result become $a^2 = a^2(e^2 – 1)$ or $e^2 = 2$ or $e = \sqrt{2}$
    2. ü In parametric form, its coordinates are $x= ct, y = c/t, t \in R \sim \{0\}$
    3. ü Equation of a chord joining the points $P(t_1)$ and $Q(t_2)$ is
    4. $x + t_1t_2y = c(t_1 + t_2)$ with slope $m = -1/ t_1t_2$
    5. Equation of tangent at P (x_1, y_1) is $x/x_1 + y/y_1 = 2$
    6. Equation of tangent at P(t) is $x/t + ty = 2c$
    7. Equation of normal is $y-c/t = t^2(x-ct)$
- Chord whose middle point is given to be (h, k) is $kx + hy = 2hk$