

7.6 Hyperbola

Transverse axis: a

Conjugate axis: b

Foci: $F_1(-c, 0)$, $F_2(c, 0)$

Distance between the foci: $2c$

Eccentricity: e

Asymptotes: s, t

Real numbers: A, B, C, D, E, F, t, k

- 656.** Equation of a Hyperbola (Standard Form)

$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

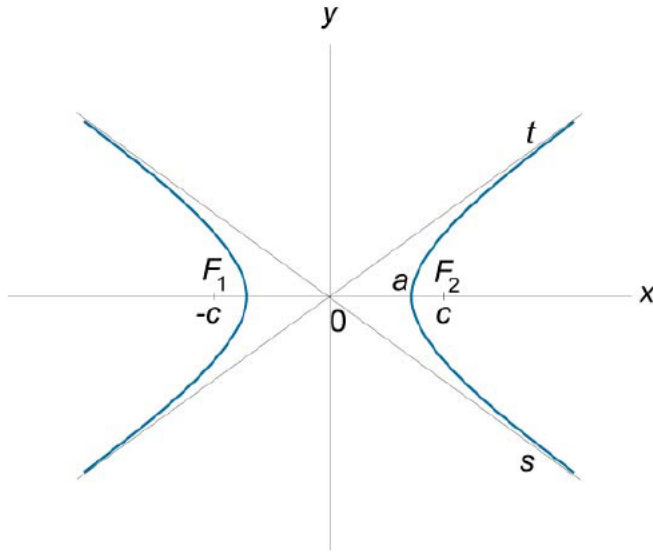


Figure 117.

- 657.** $|r_1 - r_2| = 2a$,
 where r_1, r_2 are distances from any point $P(x, y)$ on the hyperbola to the two foci.

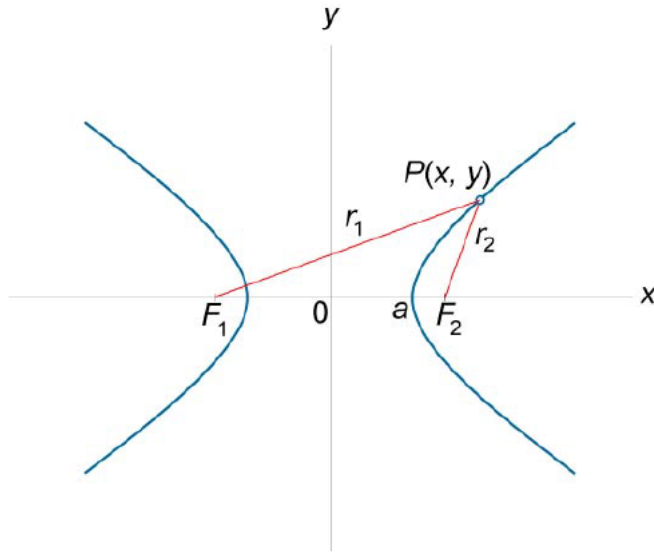


Figure 118.

658. Equations of Asymptotes

$$y = \pm \frac{b}{a}x$$

659. $c^2 = a^2 + b^2$

660. Eccentricity

$$e = \frac{c}{a} > 1$$

661. Equations of Directrices

$$x = \pm \frac{a}{e} = \pm \frac{a^2}{c}$$

662. Parametric Equations of the Right Branch of a Hyperbola

$$\begin{cases} x = a \cosh t \\ y = b \sinh t \end{cases}, 0 \leq t \leq 2\pi.$$

663. General Form

$$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0,$$

where $B^2 - 4AC > 0$.

664. General Form with Axes Parallel to the Coordinate Axes

$$Ax^2 + Cy^2 + Dx + Ey + F = 0,$$

where $AC < 0$.

665. Asymptotic Form

$$xy = \frac{e^2}{4},$$

or

$$y = \frac{k}{x}, \text{ where } k = \frac{e^2}{4}.$$

In this case, the asymptotes have equations $x=0$ and $y=0$.

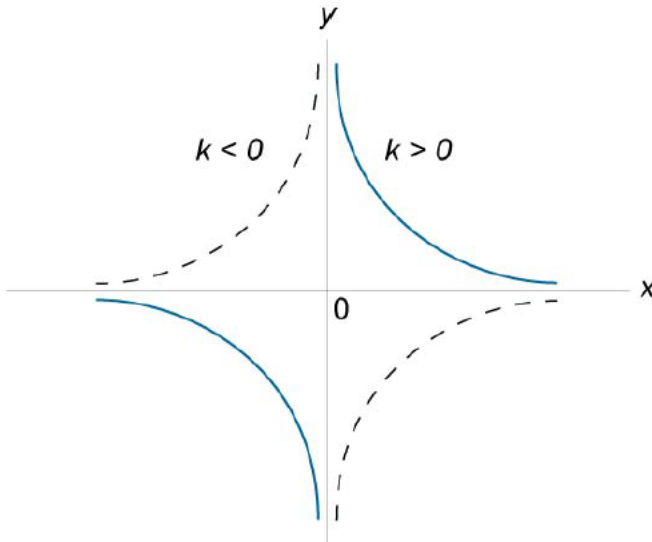


Figure 119.

