

## 7.5 Ellipse

Semimajor axis:  $a$

Semiminor axis:  $b$

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

Distance between the foci:  $2c$

Eccentricity:  $e$

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

Perimeter:  $L$

Area:  $S$

### 645. Equation of an Ellipse (Standard Form)

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

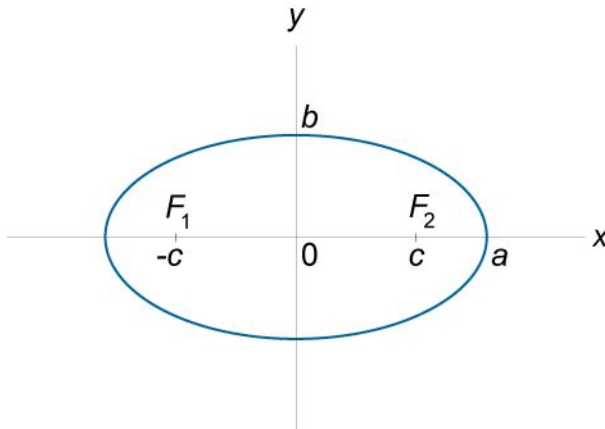


Figure 115.

646.  $r_1 + r_2 = 2a$ ,

where  $r_1$ ,  $r_2$  are distances from any point  $P(x, y)$  on the ellipse to the two foci.



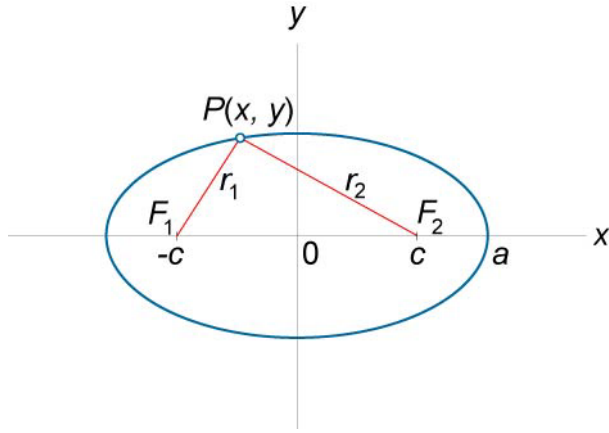


Figure 116.

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

648. Eccentricity

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

649. Equations of Directrices

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

650. Parametric Form

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

651. General Form

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

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

652. General Form with Axes Parallel to the Coordinate Axes

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

where  $AC > 0$ .



**653.** Circumference

$$L = 4aE(e),$$

where the function  $E$  is the complete elliptic integral of the second kind.

**654.** Approximate Formulas of the Circumference

$$L = \pi \left( 1.5(a + b) - \sqrt{ab} \right),$$

$$L = \pi \sqrt{2(a^2 + b^2)}.$$

**655.**  $S = \pi ab$

