

Curso Cero

Curso 2025/26

Pedro José Hernando Oter



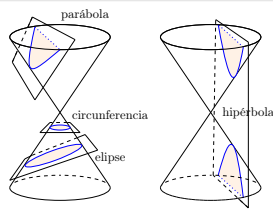
Departamento de Matemáticas
Universidad Carlos III de Madrid

Tema 5

Cónicas

- Secciones Cónicas
- Circunferencia
- Elipse
- Hipérbola
- Parábola

Cónicas

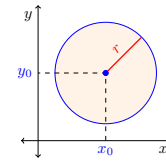


Ecuación General de las Cónicas

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

$$B^2 - 4AC \begin{cases} < 0 & : \text{Circunferencia o Elipse} \\ = 0 & : \text{Parábola} \\ > 0 & : \text{Hipérbola} \end{cases}$$

Circunferencia

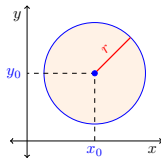


Circunferencia (Ec. Canónica)

$$(x - x_0)^2 + (y - y_0)^2 = r^2 \quad \begin{cases} (x_0, y_0) & : \text{centro} \\ r > 0 & : \text{radio} \end{cases}$$

$$\text{centro}=(0,0) \rightarrow x^2 + y^2 = r^2$$

Circunferencia

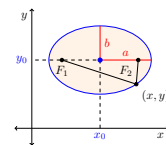


Circunferencia (Ec. General)

$$(x - x_0)^2 + (y - y_0)^2 = r^2 \Rightarrow x^2 + y^2 - \underbrace{2x_0}_{D}x - \underbrace{2y_0}_{E}y + \underbrace{x_0^2 + y_0^2 - r^2}_{F} = 0$$

$$x^2 + y^2 + Dx + Ey + F = 0 \quad \begin{cases} (x_0, y_0) & = \left(-\frac{D}{2}, -\frac{E}{2}\right) \\ r & = \sqrt{\frac{D^2}{4} + \frac{E^2}{4} - F} \end{cases}$$

Elipse

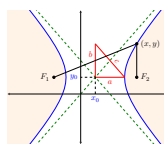


Elipse

$$\frac{(x - x_0)^2}{a^2} + \frac{(y - y_0)^2}{b^2} = 1 \quad \begin{cases} (x_0, y_0) & : \text{centro} \\ a, b & : \text{semiejes} \end{cases}$$

$$\text{centro}=(0,0) \rightarrow \frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

Hipérbola

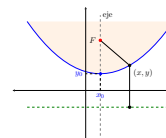


Hipérbola

$$\frac{(x - x_0)^2}{a^2} - \frac{(y - y_0)^2}{b^2} = 1 \quad \begin{cases} (x_0, y_0) & : \text{centro} \\ a, b & : \text{semiejes} \end{cases}$$

$$\text{centro}=(0,0) \rightarrow \frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$$

Parábola



Parábola

$$4p(y - y_0) = (x - x_0)^2 \quad \begin{cases} (x_0, y_0) & : \text{vértice} \\ (x_0, y_0 + p) & : \text{foco} \\ y = y_0 - p & : \text{directriz} \end{cases}$$

$$\text{vértice}=(0,0) \rightarrow 4py = x^2$$