

7.7 Parabola

Focal parameter: p

Focus: F

Vertex: $M(x_0, y_0)$

Real numbers: $A, B, C, D, E, F, p, a, b, c$

666. Equation of a Parabola (Standard Form)

$$y^2 = 2px$$

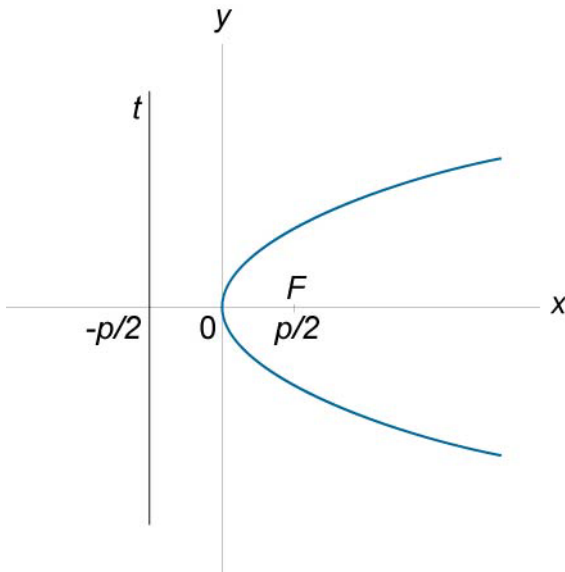


Figure 120.

Equation of the directrix

$$x = -\frac{p}{2},$$

Coordinates of the focus

$$F\left(\frac{p}{2}, 0\right),$$

Coordinates of the vertex

$$M(0, 0).$$

667. General Form

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

$$\text{where } B^2 - 4AC = 0.$$

668. $y = ax^2, p = \frac{1}{2a}.$

Equation of the directrix

$$y = -\frac{p}{2},$$

Coordinates of the focus

$$F\left(0, \frac{p}{2}\right),$$

Coordinates of the vertex

$$M(0, 0).$$

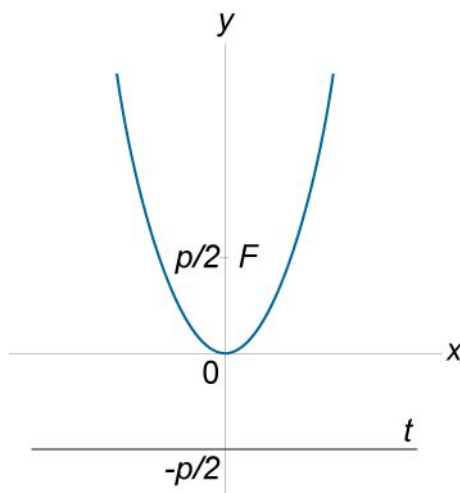


Figure 121.

669. General Form, Axis Parallel to the y-axis

$$Ax^2 + Dx + Ey + F = 0 \quad (A, E \text{ nonzero}),$$

$$y = ax^2 + bx + c, \quad p = \frac{1}{2a}.$$

Equation of the directrix

$$y = y_0 - \frac{p}{2},$$

Coordinates of the focus

$$F\left(x_0, y_0 + \frac{p}{2}\right),$$

Coordinates of the vertex

$$x_0 = -\frac{b}{2a}, \quad y_0 = ax_0^2 + bx_0 + c = \frac{4ac - b^2}{4a}.$$

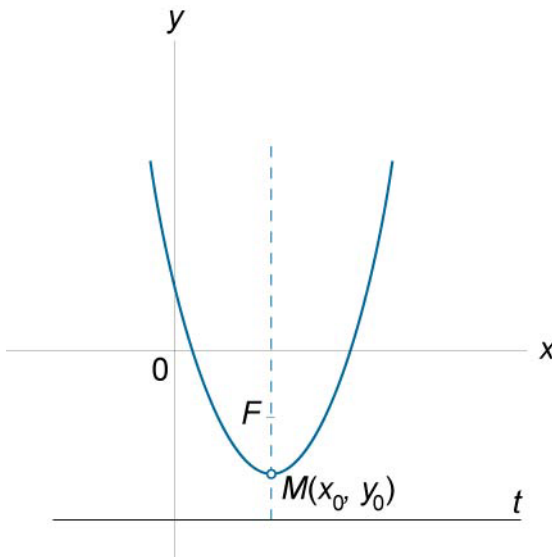


Figure 122.