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)

$$y^2 = 2px$$

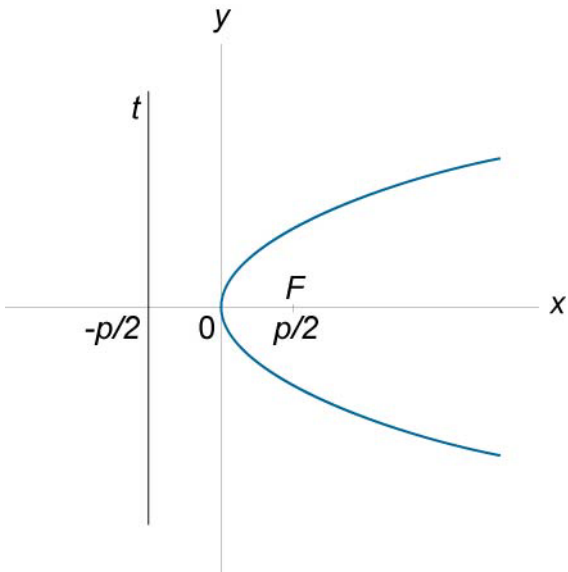

Figure 120.

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
$Ax^2 + Bxy + Cy^2 + Dx + Ey + F = 0$,
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
$M(0, 0)$.

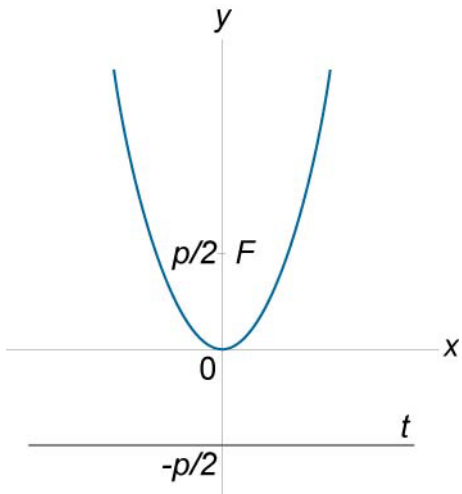

Figure 121.

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

$Ax^2 + Dx + Ey + F = 0$ (A, E nonzero),

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

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

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

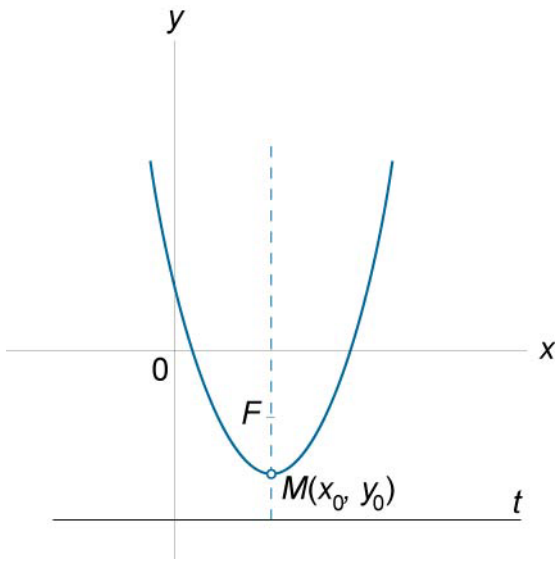

Figure 122.