

2.6 Equations

Real numbers: a, b, c, p, q, u, v

Solutions: x_1, x_2, y_1, y_2, y_3

119. Linear Equation in One Variable

$$ax + b = 0, \quad x = -\frac{b}{a}.$$

120. Quadratic Equation

$$ax^2 + bx + c = 0, \quad x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}.$$

121. Discriminant

$$D = b^2 - 4ac$$

122. Viète's Formulas

If $x^2 + px + q = 0$, then

$$\begin{cases} x_1 + x_2 = -p \\ x_1 x_2 = q \end{cases}.$$

123.

$$ax^2 + bx = 0, \quad x_1 = 0, \quad x_2 = -\frac{b}{a}.$$

124.

$$ax^2 + c = 0, \quad x_{1,2} = \pm \sqrt{-\frac{c}{a}}.$$

125. Cubic Equation. Cardano's Formula.

$$y^3 + py + q = 0,$$

$$y_1 = \mathbf{u} + \mathbf{v}, \quad y_{2,3} = -\frac{1}{2}(\mathbf{u} + \mathbf{v}) \pm \frac{\sqrt{3}}{2}(\mathbf{u} + \mathbf{v})\mathbf{i},$$

where

$$\mathbf{u} = \sqrt[3]{-\frac{\mathbf{q}}{2} + \sqrt{\left(\frac{\mathbf{q}}{2}\right)^2 + \left(\frac{\mathbf{p}}{3}\right)^2}}, \quad \mathbf{v} = \sqrt[3]{-\frac{\mathbf{q}}{2} - \sqrt{\left(\frac{\mathbf{q}}{2}\right)^2 + \left(\frac{\mathbf{p}}{3}\right)^2}}.$$