

# **Mathematics 1 - Quadratic Equations**

**Topics :** <u>Computer engineering</u> Written on <u>March 13, 2024</u>

# 1. **Definition:**

- $\circ\,$  A quadratic equation is a second-degree polynomial equation in one variable. It has the form: ax^2 + bx + c = 0
- $\circ\,$  Here, a, b, and c are constants, and x is the variable. a cannot be equal to 0, otherwise, it wouldn't be a quadratic equation.

## 2. Solutions:

- Quadratic equations typically have two solutions, which can be real or complex numbers. These solutions are called roots or zeroes of the equation.
- The solutions can be found using methods like factoring, completing the square, quadratic formula, or graphical methods.

#### 3. Discriminant:

- The discriminant ( $\Delta$ ) of a quadratic equation is given by:  $\Delta = b^2 4ac$
- $\circ\,$  The discriminant determines the nature of the roots:
  - If  $\Delta > 0$ , the equation has two distinct real roots.
  - If  $\Delta = 0$ , the equation has exactly one real root (the roots are repeated).
  - If  $\Delta < 0$ , the equation has two complex roots.

#### 4. Vertex:

• The vertex of a quadratic function in the form  $y = ax^2 + bx + c$  is given by the point (h, k), where: h = -b/2a and  $k = f(h) = ah^2 + bh + c$ 

#### 5. **Graph:**

- $\circ~$  The graph of a quadratic equation is a parabola. The direction of the parabola (upward or downward) depends on the sign of the leading coefficient a.
- $\circ\,$  The axis of symmetry of the parabola is a vertical line passing through the vertex.

## 6. Applications:

- $\circ\,$  Quadratic equations are widely used in various fields, including physics, engineering, economics, and computer science.
- $\circ~$  They describe many natural phenomena, such as projectile motion, the shape of satellite dishes, and the pricing of products based on supply and demand.

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