

Chapter 4

Quadratic Equation

- Introduction
- Polynomial Equation
 - Equation and Identity
- Quadratic Equation
 - Newton's Theorem
 - Nature of Roots of Quadratic Equation $ax^2 + bx + c = 0$, $a \neq 0$, a, b, c all are real numbers.
- Properties Related to Nature of Roots of Quadratic Equation
- Condition for Common Root(s) of Quadratic Equations
 - Condition for One Common Root between two Quadratic Equations
 - Condition for two Quadratic Equations to have both Roots Common
- Quadratic Expression
 - Range of the Quadratic Function
- Sign of the Quadratic Expression with Graphical Perspective
 - Graph of $y = f(x)$ touches x-axis
 - Graph of $y = f(x)$ neither touches nor intersects x-axis.
- Location of Roots
- Relation between Roots and Coefficients of a Polynomial Equation
- Transformation of Equation
- Quadratic Expression in Two Variables

INTRODUCTION

This section explores the fundamental principles of equations. the methods for solving quadratic equations were covered in earlier lessons. now, we will delve into the advanced applications of quadratic equations in a systematic manner.

POLYNOMIAL EQUATION

A mathematical expression in the format of

$$a_0x^n + a_1x^{n-1} + a_2x^{n-2} + a_3x^{n-3} + \dots + a_{n-1}x + a_n = 0$$

where $a_0 \neq 0, a_1, a_2, a_3, \dots, a_{n-1}, a_n$

A polynomial equation in a single variable x , characterized by constants a, b, c , etc., and where n is a positive integer, is denoted as a polynomial equation of n th degree.

Equation and identity

An equation represents the equality between two mathematical expressions, while an identity is a type of equation where two mathematical expressions are equal for all permissible values of their variables.

for instance, $x^2 - 5x + 6 = 0$ is a single-variable equation since it is fulfilled only by the specific values $x = 2$ and $x = 3$, but..

$$\frac{(x-a)(x-b)}{(c-a)(c-b)} + \frac{(x-b)(x-c)}{(a-b)(a-c)} + \frac{(x-c)(x-a)}{(b-c)(b-a)} = 1$$

Is an identity since it holds true for all real values of x .

The variable's value that satisfies the equation is referred to as the root of the equation. in the previous example, $x = 2$ and

$x = 3$ serve as roots of the equation. $x^2 - 5x + 6 = 0$