

1. What is a Polynomial?

A polynomial is an algebraic expression consisting of variables, coefficients, and exponents, where the exponents are non-negative integers.

1.1 General Form of a Polynomial:

$$P(x) = a_n x^n + a_{n-1} x^{n-1} + \dots + a_1 x + a_0$$

where:

- a_n, a_{n-1}, \dots, a_0 are coefficients,
- n is the degree of the polynomial, and
- x is the variable.

2. Classification of Polynomials Based on Degree

- Linear Polynomial: Degree = 1 (e.g., $P(x) = ax + b$).
- Quadratic Polynomial: Degree = 2 (e.g., $P(x) = ax^2 + bx + c$).
- Cubic Polynomial: Degree = 3 (e.g., $P(x) = ax^3 + bx^2 + cx + d$).

3. What are Zeroes of a Polynomial?

The zeroes of a polynomial are the values of x for which $P(x) = 0$.

4. How to Check the Number of Zeroes of a Polynomial Graphically?

- The number of zeroes of a polynomial corresponds to the number of times its graph intersects the x -axis.
- Example:
 - A linear polynomial intersects the x -axis at 1 point \rightarrow 1 zero.
 - A quadratic polynomial intersects the x -axis at most 2 points \rightarrow 2 zeroes.
 - A cubic polynomial intersects the x -axis at most 3 points \rightarrow 3 zeroes.

5. Relation Between Zeroes of a Quadratic Polynomial and Its Coefficients

For a quadratic polynomial $P(x) = ax^2 + bx + c$:

- Sum of zeroes $(\alpha + \beta) = -\frac{b}{a}$
- Product of zeroes $(\alpha \cdot \beta) = \frac{c}{a}$

6. How to Make a Quadratic Polynomial When Sum and Product of Its Roots are Given?

If the sum of roots $(\alpha + \beta)$ and the product of roots $(\alpha \cdot \beta)$ are given, the quadratic polynomial can be written as:

$$P(x) = x^2 - (\text{Sum of roots})x + (\text{Product of roots})$$