Polynomials - Points to Remember

1. General Form of a Polynomial:

Let x be a variable, n be a positive integer and a0, a1, a2, …, an be constants (real numbers). Then, f(x)=anxn+an-1xn-1+⋯+a1x+a0 is called a polynomial in variable *x*.

2. Types of Polynomials based on Degree:

The exponent of the highest degree term in a polynomial is known as its degree. A polynomial of degree 0 is called a constant polynomial. A polynomial of degree 1, 2 or 3 is called a linear polynomial, a quadratic polynomial, or a cubic polynomial, respectively.

Following are the forms of various degree polynomials:

Degree	Name of the polynomial	Form of the polynomial
0	Constant polynomial	f(x)=a
1	Linear polynomial	f(x)=ax+b, a≠0
2	Quadratic polynomial	f(x)=ax2+bx+c, a≠0
3	Cubic polynomial	f(x)=ax3+bx2+cx+d, a≠0
4	Bi-quadratic polynomial	f(x)=ax4+bx3+cx2+dx+e, a≠0

3. Zeros of a Polynomial:

(i) A real number α is a zero of a polynomial f(x), if f(α)=0.

(ii) A polynomial of degree n can have at most n real zeros.

4. Value of a Polynomial:

If f(x) is a polynomial and α is any real number, then the real number obtained by replacing x by α in f(x) is known as the value of f(x) at x=α and is denoted by f(α).

5. Geometrical Meaning of Zeros of a Polynomial:

Geometrically the zeros of a polynomial f(x) are the x-coordinates of the points where the graph y=f(x) intersects x- axis.

6. Relation between Roots and Coefficients:

(i) If α and β are the zeros of a quadratic polynomial f(x)=ax2+bx+c, then

(a) α+β=-ba=- Coefficient of x Coefficient of x2

(b) αβ=ca= Constant term Coefficient of x2

(ii) If α, β, γ are the zeros of a cubic polynomial f(x)=ax3+bx2+cx+d, then

(a) α+β+γ=-ba=- Coefficient of x2 Coefficient of x3

(b) αβ+βγ+γα=ca= Coefficient of x Coefficient of x3

(c) αβγ=-da=- Constant term Coefficient of x3

(iii) If α, β, γ, δ are the zeros of a bi-quadratic polynomial f(x)=ax4+bx3+cx2+dx+e, then

(a) α+β+γ+δ=-ba=- Coefficient of x3 Coefficient of x4

(b) α+βγ+δ+αβ+γδ=ca= Coefficient of x2 Coefficient of x4

(c) α+βγδ+αβγ+δ=-da=- Coefficient of x Coefficient of x4

(d) αβγδ=ea= Constant terms Coefficient of x4