CBSE Class 09 Mathematics

Revision Notes

CHAPTER – 2

POLYNOMIALS

1. Polynomials in one Variable
2. Zeroes of a Polynomial
3. Remainder Theorem
4. Factorisation of Polynomials
5. Algebraic Identities

Constants : A symbol having a fixed numerical value is called a constant.

Variables : A symbol which may be assigned different numerical values is known as variable.

Algebraic expressions : A combination of constants and variables connected by some or all of the operations +, -, *,/ is known as algebraic expression.

Terms : The several parts of an algebraic expression separated by '+' or '-' operations are called the terms of the expression.

Polynomials : An algebraic expression in which the variables involved have only non-negative integral powers is called a polynomial.

(i) $5x^2 - 4x^2 - 6x - 3$ is a polynomial in variable x.

(ii) $5 + 8x^{\frac{3}{2}} + 4x^{-2}$ is an expression but not a polynomial.

Polynomials are denoted by p(x), q(x) and r(x) etc.

Coefficients : In the polynomial $x^3 + 3x^2 + 3x + 1$,, coefficient of $x^3,\ x^2,\ x\ are\ 1,\ 3,\ 3$ respectively and we also say that +1 is the constant term in it.

Degree of a polynomial in one variable: In case of a polynomial in one variable the highest power of the variable is called the degree of the polynomial.

A polynomial of degree n has n roots.

Classification of polynomials on the basis of degree.

degree	Polynomial	Example
(a) 1	Linear	$x+1,\ 2x+3\,etc.$
(b) 2	Quadratic	$ax^2+bx+c\ \ etc.$
(c) 3	Cubic	$x^3+3x^2+1\ \ \ etc.$
(d) 4	Biquadratic	x^4-1

Classification of polynomials on the basis of number of terms

No. of terms	Polynomial & Examples.
(i) 1	Monomial - $5, 3x, \frac{1}{3}y\ etc.$
(ii) 2	Binomial - $(3+6x),\ (x-5y)$ etc.
(iii) 3	Trinomial- $2x^2+4x+2\ etc.$

Constant polynomial : A polynomial containing one term only, consisting a constant term is called a constant polynomial.The degree of non-zero constant polynomial is zero.

Zero polynomial : A polynomial consisting of one term, namely zero only is called a zero polynomial.

The degree of zero polynomial is not defined.

Zeroes of a polynomial : Let $p(x)$ be a polynomial. If $p(a)$ =0, then we say that "a" is a zero of the polynomial of p(x).

Remark : Finding the zeroes of polynomial p(x) means solving the equation p(x)=0.

Remainder theorem : Let $f(x)$ be a polynomial of degree $n \geqslant 1$ and let a be any real number. When f(x) is divided by $(x-a)$ then the remainder is f (a)

Factor theorem : Let f(x) be a polynomial of degree n > 1 and let a be any real number.

If f(a) = 0 then, (x – a) is factor of f(x)

If f(x – a) is factor of f(x) then f(a) = 0

Factor : A polynomial $p(x)$ is called factor of $q(x)$ divides $q(x)$ exactly.

Factorization : To express a given polynomial as the product of polynomials each of degree less than that of the given polynomial such that no such a factor has a factor of lower degree, is called factorization.

Some algebraic identities useful in factorization:

(i) $(x+y)^2$= $(x)^2$+2xy+$(y)^2$

(ii) $(x-y)^2$= $(x)^2$-2xy+$(y)^2$

(iii) x^2-y^2 =(x-y)(x+y)

(iv) (x+a)(x+b)= $(x)^2$ +(a+b)x+ab

(v)$(x+y+z)^2$ =$x^2+y^2+z^2$ +2xy+2yz+2zx

(vi) $(x+y)^3$=x^3 +y^3 +3xy(x+y)

(vii) $(x-y)^3$ =x^3-y^3 -3xy(x-y)

(viii) x^3 + y^3 + z^3 - 3xyz =(x+y+z) (x^2 + y^2 + z^2 - xy - yz - zx)

x^3+y^3 +z^3=3xyz if x+y+z=0

(ix) $a^3+b^3=(a+b)\left(a^2-ab+b^2\right)$

(x) $a^3-b^3=(a-b)\left(a^2+ab+b^2\right)$