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	$x^3+3x^2+1\quad etc.$
(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) $a^3 - b^3 = (a-b)\left(a^2 + ab + b^2\right)$