CBSEASSISTANCE.COM

POLYNOMIALS
CLASS 10

Basic Concepts

1. An expression of the form $p(x) = a_0 + a_1x + a_2x^2 + \cdots + a_nx^n$, where $ax^2 + bx + c$, is called a polynomial in x of degree n.
   Here, $a_0, a_1, a_2, \ldots, a_n$ are real numbers and each power of x is a non – negative integer.
2. 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**.
3. A polynomial of degree 1 is called a linear polynomial. A **linear polynomial** is of the form $p(x) = ax + b$, where $a \neq 0$.
4. A polynomial of degree 2 is called a **quadratic polynomial**. A quadratic polynomial is of the form $p(x) = ax^2 + bx + c$, where $a \neq 0$.
5. A polynomial of degree 3 is called a **cubic polynomial**. A cubic polynomial is of the form $p(x) = ax^3 + bx^2 + cx + d$, where $a \neq 0$.
6. A polynomial of degree 4 is called a **biquadratic polynomial**. A biquadratic polynomial is of the form $p(x) = ax^4 + bx^3 + cx^2 + dx + e$, where $a \neq 0$.
7. If $p(x)$ is a polynomial in x and if α is any real number, then the value obtained by putting $x = \alpha$ in $p(x)$ is called the value of $p(x)$ at $x = \alpha$. The value of $p(x)$ at $x = \alpha$ is denoted by $p(\alpha)$.
8. A real number α is called a zero of the polynomial $p(x)$, if $p(\alpha) = 0$.
9. A polynomial of degree n can have at most n real zeroes.
10. Geometrically the zeroes of a polynomial $p(x)$ are the $x -$ coordinates of the points, where the graph of $p(\alpha) = 0$ intersects $x -$ axis.
11. Zero of the linear polynomial $ax + b$ is $\frac{-b}{a} = \frac{-\,constant\ term}{coefficient\ of\ x}$
12. If α and β are the zeroes of the quadratic polynomial
    $p(x) = ax^2 + bx + c, a \neq 0$, then
    $$\alpha + \beta = \frac{-b}{a} = \frac{-\,coefficient\ of\ x^2}{coefficient\ of\ x^3},$$

$$\alpha\beta = \frac{c}{a} = \frac{constant\ term}{coefficient\ of\ x^2}$$

13. If α, β and γ are the zeroes of a cubic polynomial $p(x) = ax^3 + bx^2 + cx + d, a \neq 0$, then

$$\alpha + \beta + \gamma = \frac{-b}{a} = \frac{-\ coefficient\ of\ x^2}{coefficient\ of\ x^3}$$

$$\alpha\beta + \beta\gamma + \gamma\alpha = \frac{c}{a} = \frac{coefficient\ of\ x}{coefficient\ of\ x^3}$$

$$\alpha\beta\gamma = \frac{-\ d}{a} = \frac{-\ constant\ term}{coefficient\ of\ x^3}$$

14. A quadratic polynomial whose zeroes are α, β is given by
$p(x) = x^2 - (\alpha + \beta)x + \alpha\beta$
$= x^2$ −(sum of zeroes)x + product of zeroes.

15. A cubic polynomial whose zeroes are α, β, γ is given by
$p(x) = x^3 - (\alpha + \beta + \gamma)x^2 + (\alpha\beta + \beta\gamma + \gamma\alpha)x - \alpha\beta\gamma$
$= x^3 - (sum\ of\ the\ zeroes)x^2 +$
$(sum\ of\ the\ product\ of\ the\ zeroes\ taken\ two\ at\ a\ time)x -$
$product\ of\ zeroes.$

16. The division algorithm states that given any polynomial $p(x)$ and any non – zero polynomial $g(x)$, there exist polynomials $q(x)$ and $r(x)$ such that $p(x) = g(x).q(x) + r(x)$, where $r(x) = 0$ or degree $r(x) <$ degree $g(x)$.