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Chapter

Polynomials

Key Points

1. **Polynomial :** If x is a variable, n is a natural number and $a_0, a_1, a_2, a_3, \ldots\ldots\ldots$ a_n are real numbers, then $p(x) = a_n x^n + a_{n-1} x^{n-1} + \ldots\ldots\ldots + a_1 x + a_0$, $(a_n \neq 0)$ is called a polynomial in x.
2. Polynomials of degree 1, 2 and 3 are called linear, quadratic and cubic polynomials respectively.
3. A quadratic polynomial is an algebraic expression of the form $ax^2 + bx + c$, where a, b, c are real numbers with $a \neq 0$.
4. Zeroes of a polynomial $p(x)$ are precisely the x – coordinates of the points where the graph of $y = p(x)$ intersects the x–axis, *i.e.*, $x = a$ is a zero of polynomial $p(x)$ if $p(a) = 0$
5. A polynomial can have at most the same number of zeroes as the degree of the polynomial.
6. (*i*) If one zero of a quadratic polynomial $p(x)$ is negative of the other, then co-efficient of $x = 0$

   (*ii*) If zeroes of a quadratic polynomial $p(x)$ are reciprocal of each other, then co-efficient of x^2 = constant term.
7. Relationship between zeroes and coefficients of a polynomial

   If α And β Are zeroes of $p(x)$ $ax^2 + bx + c$ $(a \neq 0)$, them

   Sum of zeroes = $\alpha + \beta = -\dfrac{b}{a}$

   Product of zeroes = $\alpha\beta = \dfrac{c}{a}$
8. If α, β are zeroes of a quadratic polynomial $p(x)$, then

   $p(x) = k\,[x^2 - (\text{sum of zeroes})\,x + \text{product of zeroes}]$

   $\Rightarrow\ p(x) = k\,[x^2 - (\alpha + \beta)x + \alpha\beta\ ]$; where k is any non-zero real number.
9. Graph of linear polynomial $p(x) = ax + b$ is a straight line.
10. Division Algorithm states that given any polynomials $p(x)$ and $g(x)$, there exist polynomial $q(x)$ and $r(x)$ such that:

    $p(x) = g(x).\ q(x) + r(x)$; $g(x) \neq 0$,

    [where either $r(x) = 0$ or degree $r(x) <$ degree $g(x)$]