

Class IX
Ch-02 Polynomials

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Constant :- A symbol having a fixed numerical value is called a constant, Example: 9, 2, -6, π

Variables :- A symbol which may be assigned different numerical value is known as a variable.

(4) Ex, $2x$, Here 2, is constant and x is variable.

(11) $-4x^2$, Here 4 is constant and x^2 is variable

Number of Terms in Polynomials

(1) Monomial : A Polynomial containing one term is called monomial. Example, 4, $3x$, $8x^3$, $4x^2$ etc

(2) Binomial : A Polynomial containing two non-zero terms is called a Binomial

Example

(3) Trinomial : A Polynomial containing three non-zero terms is called Trinomials

Example: $(x^2 + 3x + 4)$, $x^3 + x^2 + 3$, etc

Degree : The Highest Power of a variable is called degree. Ex x^3 , 3 degree
 $4x^7 + x^6 + x^2$, x^7 Highest 7 degree

Coefficient :- In Polynomials, The multiples of variable is called coefficient

Ex $4x^2$, so ~~at~~ The coefficient of x^2 is 4.

Polynomials of Various Degrees

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- (i) Linear Polynomial: A Polynomial of degree 1 is called a linear Polynomial, Ex, $5x+8$, $8z$
- (ii) Quadratic Polynomial: - A polynomial of degree 2 is called quadratic polynomial, Ex $3x^2+8$, $9x^2-x$
- (iii) Cubic Polynomial: A Polynomial of degree 3 is called Polynomial, Ex $2x^3+x^2+1$, $4x^3+3$

Constant Polynomial A Polynomial containing one term, consisting of a nonzero constant is called a Constant Polynomial
Ex 6 , -8 , 3 , $\frac{9}{12}$ etc.

Zero Polynomial: - A Polynomials ~~consisting~~ consisting of one term, namely zero, is called a Zero Polynomial.

Ch-02, Ex 2A (RS Aggarwal)

Solve it

Value of a Polynomial

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The value of a polynomial $P(x)$ at $x = \alpha$ is obtained by putting $x = \alpha$ in $P(x)$ and it is denoted by $P(\alpha)$

Ex 1. $P(x) = 3x^2 - 5x + 6$ find $P(2)$

\Rightarrow put $x = 2$ in $P(x)$

$$P(2) = 3 \times (2)^2 - 5 \times 2 + 6$$

$$= 3 \times 4 - 10 + 6$$

$$= 12 - 10 + 6$$

$$= 2 + 6 = 8 \text{ Ans}$$

Zeros of a polynomial

Let $P(x)$ be a polynomial. If $P(\alpha) = 0$ then we say that α is a zero of the polynomial $P(x)$

Ex 1. Find a zero of the polynomial

(i) $P(x) = x - 3$

(ii) $P(x) = 3x + 2$

sol if $P(x) = 0$

sol $P(x) = 0$

Then $x - 3 = 0$

$$3x + 2 = 0$$

so $x = 3$

$$3x = -2$$

$$x = -\frac{2}{3}$$

Ch 2, Ex 2B (R.S. Aggarwal)
Solve It

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Division Algorithm in Polynomials

$$\text{dividend} = (\text{divisor} \times \text{quotient}) + \text{Remainder}$$

Ex

$$\begin{array}{r}
 \text{Divisor } x+2 \overline{) \text{Dividend } x^2 + x + 2} \\
 \underline{x^2 + 2x} \\
 -x + 2 \\
 \underline{-x - 2} \\
 4
 \end{array}$$

Quotient $x-1$

4 ← Remainder

Remainder Theorem: Let $P(x)$ be a Polynomial of degree 1 or more and let α be any real number. If $P(x)$ is divided by $(x-\alpha)$ then the remainder is $P(\alpha)$.

Ex:- Find the remainder when the Polynomial $P(x) = x^4 + 2x^3 - 3x^2 + x - 1$ is divided by $g(x) = x - 2$

Sol $g(x) = 0 \Rightarrow x - 2 = 0 \Rightarrow x = 2$
 put $x = 2$ in $P(x)$

$$\begin{aligned}
 P(2) &= (2^4) + 2 \times (2)^3 - 3 \times 2^2 + 2 - 1 \\
 &= 16 + 16 - 12 + 2 - 1 = 21
 \end{aligned}$$

ch-02, Ex 2 C solve it (RS Aggarwal).

Factor Theorem

Let $P(x)$ be a polynomial of degree 1 or more and let α be any real number.

(i) if $P(\alpha) = 0$ then $(x - \alpha)$ is a factor of $P(x)$

(ii) if $(x - \alpha)$ is a factor of $P(x)$ then $P(\alpha) = 0$

Example Using factor theorem,

Show that $g(x)$ is a factor of $P(x)$, when $P(x) = x^3 - 8$, $g(x) = x - 2$

Sol If $g(x) = 0 \Rightarrow x - 2 = 0 \Rightarrow x = 2$
put $x = 2$ in $P(x)$

$$P(2) = (2)^3 - 8 = 8 - 8 = 0$$

$P(2) = 0$ it follows that $g(x)$ is a factor of $P(x)$

Ch-02 Ex 2D solve It (RS Aggarwal)