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LORD BUDDHA NATIONAL PUBLIC SCHOOL
JAUNPUR
CLASS – IX
SUBJECT – MATHS

CHAPTER – POLYNOMIALS

Constants → A symbol having a fixed numerical value is called a constant.
E.g. → 8, −6, $\frac{5}{7}$, π etc are constants.

Variables → A symbol which may be assigned different numerical values.
E.g. → Circumference of a circle $C = 2\pi r$ where r is the radius of a circle.
Here, 2 and π are constants, while C and r are variables.

Algebraic Expressions

A combination of constants and variables connected by some or all of the operations $+, -, \times$ and $\div$ is known as algebraic expression.

Polynomials

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

E.g. →
- $5x^3 - 4x^2 + 6x - 3$ is a polynomial in one variable x.
- $9y^4 + 6y^3 - 8y + \frac{2}{5} + 6x^2y - 3xy$ is a polynomial in two variables x and y.

NOTE $5 + 8x^{3/2} + 4x^2$ is an expression but

not a polynomial, since it contains a term containing $x^{3/2}$ where 3/2 is not a non-negative integer.

Coefficients

In the polynomial $5x^3 - 4x^2 + 6x - 3$, we say that the coefficients of x^3, x^2 and x are 5, −4 and 6 respectively. and we also say that −3 is the constant term in it.

Degree of a Polynomial

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

E.g → $3x^4 - \frac{5}{2}x^2 + 1$ is a polynomial of degree 4.

Degree of a Polynomial in two or more Variables

In case of polynomials in more than one variable, the sum of the powers of the variables in each term is taken up and the highest sum so obtained is called the degree of the polynomial.

E.g → $4x^2y^3 - 5xy^2 + 7 - \sqrt{2}\,x^4$ is a polynomial in x and y of degree 5.

Polynomials of Various Degrees

(i) **Linear Polynomial**
A polynomial of degree 1 is called a linear polynomial.

E.g. → ∘ $3x+5$ is a linear polynomial in x.
∘ $x+y+8$ is a linear polynomial in x & y.

(ii) **Quadratic Polynomial**
A polynomial of degree 2 is called a quadratic polynomial.

E.g. → ∘ $3y^2-8y+5$
∘ $xy+yz+zx$.

(iii) **Cubic Polynomial**
A polynomial of degree 3 is called a cubic polynomial.

E.g. → ∘ $4x^3-3x^2+7x+1$
∘ $4x^2y-5xy^2+8xy-1$

(iv) **Biquadratic Polynomial**
A polynomial of degree 4 is called a biquadratic polynomial.

E.g. → ∘ x^4-3x^2+2
∘ $x^2y^2+xy^3+y^4-8xy+y^2+7$.

Number of terms in a Polynomial

(i) **Monomial**
A polynomial containing one non-zero

term is called a monomial.

E.g→ 5, $3x$, $\frac{1}{3}xy$ etc.

(ii) Binomial

A polynomial containing 2 non-zero terms is called binomial.

E.g→ $(3+6x)$ (x^2-5y) etc.

(iii) Trinomial

A polynomial containing three non-zero terms is called trinomial.

E.g→ $(8+3x+x^2)$, $(xy+yz+zx)$ etc.

Constant Polynomial

A polynomial containing one term only, consisting of a constant is called a constant polynomial.

E.g→ 3, -5, $\frac{7}{8}$ etc.

The degree of a nonzero constant polynomial is zero.

Zero Polynomial

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

* The degree of a zero polynomial is not defined.

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EXERCISE

(1) Which of the following expressions are polynomials?

(a) $x^3 - 5x + 2$ (b) $2\sqrt{x} + 7$
(c) $y^2 + \sqrt{2}y - \sqrt{5}$ (d) -6
(e) $4t^2 + \frac{1}{6}t + 2\sqrt{3}$ (f) 0
(g) $z + \frac{5}{z} + 1$ (h) $\sqrt[3]{y} + 4$
(i) $x^5 - 2x^3 + x + 7$ (j) $y^3 - \sqrt{3}y$
(k) $t^2 - \frac{2}{5}t + \sqrt{2}$ (l) $\sqrt[5]{z} - 6$
(m) $x - \frac{1}{x}$ (n) $x^{108} - 1$
(o) $\sqrt[3]{x} - 27$ (p) $\sqrt[3]{2}y^2 - 8$
(q) 1 (r) $x^{-2} + 2x^{-1} + 3$
(s) $-\frac{3}{5}$ (t) $\frac{1}{\sqrt{2}}x^2 - \sqrt{2}x + 2$

In case of a polynomial, write its degree.

(2) Write the degree of each of the following polynomials:

(a) $2x - \sqrt{5}$ (b) $3 - x + x^2 - 6x^3$
(c) 9 (d) $8x^4 - 36x + 5x^7$
(e) $x^9 - x^5 + 3x^{10} + 8$ (f) $2 - 3x^2$.

(3) Write coefficient of —

(a) x^3 in $2x + x^2 - 5x^3 + x^4$
(b) x in $\sqrt{3} - 2\sqrt{2}x + 4x^2$
(c) x^2 in $\frac{\pi}{3}x^2 + 7x - 3$

(d) x^2 in $3x-5$.

(4) Give an example of -

(a) a binomial of degree 27.
(b) a monomial of degree 16.
(c) a trinomial of degree 3.

(5) Classify the following as linear, quadractic, and cubic polynomials.

(a) $2x^2+4x$
(b) $x-x^3$
(c) $2-y-y^2$
(d) $-7+z$
(e) $5t$
(f) p^3
(g) $2x^3+3$
(h) $4t$
(i) $5-x-x^2$