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CH - 2
POLYNOMIALS.

- A polynomial $p(x)$ in one variable x is an algebraic expression of the form —

$$p(x) = a_n x^n + a_{n-1} x^{n-1} + a_{n-2} x^n + \dots + a_1 x + a_0$$

$a_0, a_1, a_2 \dots a_{n-1}, a_n$ = constants

$a_n \neq 0$, n = positive integer

Each of $a_n x^n$, $a_{n-1} x^{n-1} \dots a_0$ is called Term of the polynomial.

- Degree of Polynomial - Highest power of variable x in a polynomial $p(x)$.

- Polynomials on the basis of number of terms -

Monomial → Polynomial having one term.
eg:- $2x$, $5y^2$, $7y^3$.

Binomial → Polynomial having 2 terms.
eg:- $x+2$, x^2-9.

Trinomial → Polynomial having 3 terms.
eg:- $x^2+2xy+y^2$, $x+y+z$.

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- **Polynomials on the basis of degree**

Constant Polynomial → Polynomial of degree zero.
eg:- $p(x) = 3$
$g(x) = -7$.

Linear Polynomial → Polynomial of degree 1.
eg:- $p(x) = x + 3$
$g(x) = 2x - 5$.

Quadratic Polynomial → Polynomial of degree 2.
eg:- $p(x) = x^2 + 6x + 9$
$g(y) = 4y^2 - 20y + 25$.

Cubic Polynomial → Polynomial of degree 3.
eg:- $x^3 + 9x^2 + 27x + 84$.

- **Zero of Polynomial –**

A real number 'a' is zero of a polynomial $p(x)$ if $p(a) = 0$.
a = root of equation $p(x)$.

- **Remainder Theorem –**

If $p(x)$ is any polynomial of degree greater than or equal to 1, $p(x)$ is divided by the linear polynomial $(x - a)$, then the remainder is $p(a)$, where a is any real number.

• Factor Theorem -

If $p(x)$ is a polynomial of degree $n \geq 1$ & a is any real number, then

(i) $(x-a)$ is a factor of $p(x)$, if $p(a) = 0$

(ii) $p(a) = 0$, if $(x-a)$ is a factor of $p(x)$.

Ex → 2.2.

Q4) Find the zero of the polynomial -

(i) $p(x) = x + 5$.

Sol^n - $p(x) = x + 5$.

$\Rightarrow x + 5 = 0$

$\Rightarrow \boxed{x = -5.}$

(vii) $p(x) = cx + d$, $c \neq 0$, $c, d \rightarrow$ real numbers.

$p(x) = cx + d$.

$\Rightarrow cx + d = 0$

$\Rightarrow \boxed{x = \frac{-d}{c}}$

Ex → 2.3

Q3) $7 + 3x = 0$.

$\Rightarrow 3x = -7$.

$\Rightarrow x = \frac{-7}{3}$.

Remainder $= 3\left(\frac{-7}{3}\right)^3 + 7\left(\frac{-7}{3}\right)$

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$= \frac{-343}{9} + \frac{-49}{3}$.

$= \frac{-490}{9} \neq 0$

$\therefore$ $7+3x$ is not a factor of $3x^3+7x$

Ex → 2.4

Q3 (i) If $x-1$ is a factor of $p(x)$,
then $p(1) = 0$.
$\Rightarrow (1)^2 + 1 + K = 0$ By Factor Theorem
$\Rightarrow 2 + K = 0$
$\Rightarrow \boxed{K = -2.}$

Q4 (i) $12x^2 - 7x + 1$.

Using middle term split,
$= (12x^2 - 4x) - 3x + 1$
$= (12x^2 - 4x) - (3x - 1)$
$= 4x(3x-1) - 1(3x-1)$
$= (4x-1)(3x-1)$

Q5 (i) $x^3 - 2x^2 - x + 2$.
factors of 2 are ± 1 & ± 2
By trial method, we find $p(1) = 0$
So, $(x \mp 1)$ is a factor of $p(x)$.

$p(-1) = 0$.
So, $(x+1)$ is a factor of $p(x)$

Also, by trial method,

$p(-2) = 0$

$\therefore$ $(x+2)$ is a factor of $p(x)$.

$x^3 - 2x^2 - x + 2 = (x+1)(x-1)(x+2)$.

Ex - 2.5.

Q14 (i) $(-12)^3 + (7)^3 + (5)^3$.

let, $a = -12$

$b = 7$

$c = 5$.

If $x+y+z = 0$, then $x^3 + y^3 + z^3 = 3xyz$.

$-12 + 7 + 5 = 0$.

$\therefore$ $(-12)^3 + (7)^3 + (5)^3 = 3 \times (-12) \times 7 \times 5$

$= -1260$.

(ii) $(+28)^3 + (-15)^3 + (-13)^3$.

let, $a = 28$

$b = -15$

$c = -13$.

$x + y + z = 28 + (-15) + (-13) = 0$

If $x+y+z = 0$, then $x^3 + y^3 + z^3 = 3xyz$.

$(28)^3 + (-15)^3 + (-13)^3 = 3 \times (28) \times (-15) \times (-13)$

$= 16380$.

———x———

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ASSIGNMENT

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Part-A

1. Write the coefficient of y^3 in $5y^3 + 2y^2 - y + 5$

2. Find the coefficient of x^2 in $(x^2 - 1)(x - 2)$

3. If $(x - 2)$ is one of the factor of $3x - 2a$, then find the value of a.

4. Find the degree of polynomial $\frac{x^3 + 3x - 1}{5} - \frac{5}{2}x^2 - x^5$

5. If $p(x) = x^3 - 3x^2 + 2x - 3$ find the value of $p(1) + p(-1)$.

6. Find zeros of the polynomial $z^2 - 8$

7. Dividend = Divisor × Quotient + _____.

8. Give an example of Trinomial of degree 3.

9. Give one example each of monomial, binomial and quadratic polynomial.

10. Check whether $x = 3$ is a zero of polynomial $x^2 - 3x + x - 3$.

11. Write the degree of the polynomial $\sqrt{7}$

12. If one of the zero of polynomial $3x^2 + 5x + k$ is -1, then find out the value of k.

13. Express $4x^2 - 4x + 1$ as a square of binomial.

Part – B

14. Check whether q(x) is a multiple of r(x) or not.

    If $q(x) = 2x^3 - 11x^2 - 4x + 5$, $r(x) = 2x + 1$

15. Show that $(x - 5)$ is a factor of $x^3 - 3x^2 - 4x - 30$.

16. Evaluate by using suitable identity : $(997)^3$

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17. Find the zeroes of the polynomial $p(x) = x(x-2)(x+3)$

18. Find the quotient when $3x^2 - 7x - 6$ is divided by $(x-3)$

19. Factorise $8x^3 + \sqrt{27}\,y^3$.

20. If $p(x) = x + 9$, then find $p(x) + p(-x)$.

21. Find the product without multiplying directly

    106×94

22. IF $36x^2 - b = \left(6x + \frac{1}{5}\right)\left(6x - \frac{1}{5}\right)$ then find the value of b.

23. Expand using suitable identity $(2x - 3y + z)^2$

24. Find the value of $(351)^2 - (350)^2$.

Part – C

25. Factorise : $64a^2 + 96ab + 36b^2$

26. Factorise : $x^3 + 6x^2 + 11x + 6$

27. If $x^2 + y^2 = 49$ and $x - y = 3$, then find the value of $x^3 - y^3$.

28. Simplify : $(5a - 2b)(25a^2 + 10ab + 4b^2) - (2a + 5b)(4a^2 - 10ab + 25b^2)$

29. Find the sum of remainders when $x^3 - 3x^2 + 4x - 4$ is divided by $(x - 1)$ and $(x + 2)$.

30. Find the product $\left(p - \frac{1}{p}\right)\left(p + \frac{1}{p}\right)\left(p^2 + \frac{1}{p^2}\right)\left(p^4 + \frac{1}{p^4}\right)$

31. Factorise : $7\sqrt{2}\,k^2 - 10k - 4\sqrt{2}$.

32. Simplify : $(3x - 4y)^3 - (3x + 4y)^3$

33. Expand : $\left(\frac{1}{2}x - \frac{1}{4}y + 2\right)^2$ using suitable identity.

34. Simplify : $(x + y + z)^2 - (x - y - z)^2$.

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CHAPTER-2

POLYNOMIALS

ANSWERS

1. 5
2. -2
3. $a=3$
4. 5
5. -12
6. $+\sqrt{8}, -\sqrt{8}$
7. Remainder
8. x^3-3x^2+2 or any other example
9. $2x, 2x^2+3, x^2+2x-3$ or any other examples
10. Yes
11. Degree $=0$
12. $k=2$
13. $(2x-1)^2$
14. No.
15. Hint put $x=5$
16. 991026973
17. $0, 2, -3$
18. $3x+2$
19. $\left(2x+\sqrt{3}y\right)\left(4x^2-2\sqrt{3}xy+3y^2\right)$
20. 18
21. Hint $(100+6)(100-6)$
22. $\frac{1}{25}$
23. $4x^2+9y^2+z^2-12xy-6yz+4xz$
24. 701
25. $(8a+6b)^2$
26. $(x+1)(x+2)(x+3)$
27. 207
28. $117a^3-133b^3$
29. -34
30. $p^8-\frac{1}{p^8}$
31. $\left(k-\sqrt{2}\right)\left(7\sqrt{2}k+4\right)$
32. $-8y(16y^2+27x^2)$ or $-128y^3-216x^2y$
33. $\frac{x^2}{4}+\frac{y^2}{16}+4-\frac{1}{4}xy-y+2x$
34. $4xy+4zx$