Topic: Polynomials

Sub: Mathematics **Assignment: 01** Prof. Chetan Sir

Focus: Polynomial long division, applying the Remainder Theorem and Factor Theorem.

Polynomial Basics (Definition, Degree, Coefficient, Evaluation)

1. Which of the following expressions is **not** a polynomial?
(A) $5x^3 - \sqrt{2}x + 4$ (B) $\frac{x^2}{3} + 7$ (C) 10 (D) $x^{-2} + 3x + 1$

2. Identify the expression that does **not** represent a polynomial.
(A) $y^5 - 3y^2 + \frac{1}{4}$ (B) $t^2 + 2\sqrt{t} - 1$ (C) $a^3 + 3a^2b - 4b^3 + 7ab$ (D) $-8x^4 + 2x^3 - 5x^2 + x$

3. Which of the following polynomials has a degree equal to 3?
(A) $7x^2 - 9x + 15$
(B) $4x^3 - 2x(2x^2 + 5)$
(C) $(x^2 + 1)(x^2 - 1) - x^4 + 5x^2 + 2x^3$
(D) $(x + 1)^3 - x^3 - 3x^2$

4. What is the leading coefficient of the polynomial $P(x) = 8 - 2x + 5x^4 - x^3$?
(A) 5 (B) -2 (C) 8 (D) -1

5. Evaluate the polynomial $P(y) = 2y^3 - y^2 + 5y - 3$ when $y = -1$.
(A) -11 (B) -7 (C) -1 (D) 3

6. If $p(x) = x + 4$, then $p(x) + p(-x)$ is equal to:
(A) 0 (B) $2x$ (C) 4 (D) 8

Polynomial Long Division

7. Using long division, find the quotient when $x^3 + 5x^2 + 7x + 2$ is divided by $x + 2$.
(A) $x^2 + 7x + 21$ (B) $x^2 + 3x + 1$ (C) $x^2 - 3x - 1$ (D) $x^2 + 5x + 7$

8. What is the remainder when $2x^3 - 3x^2 + 4x - 5$ is divided by $x - 1$ using long division?
(A) -2 (B) 0 (C) -5 (D) 2

9. Divide $6x^4 + 5x^3 - 3x^2 + 5x - 1$ by $2x^2 - x + 1$. What is the quotient?
(A) $3x^2 - 4x - 1$ (B) $3x^2 + 4x - 1$ (C) $3x^2 - 4x + 1$ (D) $3x^2 + 4x + 1$

10. When dividing $x^4 - 2x^2 + 5x - 3$ by $x + 3$, what is the remainder obtained via long division?
(A) -3 (B) 51 (C) 45 (D) 57

11. Find the quotient and remainder when $4x^3 - 8x^2 + 3x + 9$ is divided by $2x + 1$.
(A) Quotient $2x^2 - 5x + 4$, Remainder 5
(B) Quotient $2x^2 + 5x - 4$, Remainder -5
(C) Quotient $2x^2 + 5x + 4$, Remainder 5
(D) Quotient $2x^2 - 5x - 4$, Remainder 13

12. Divide $x^5 + x^3 - 2x$ by $x^2 + 1$. What is the quotient?
(A) $x^3 - 2$ (B) $x^3 + 1$ (C) x^3 (D) $x^3 + 2x$

13. Using long division for $(3x^3 - 7x^2 + 10x - 8) \div (x - 1)$, the remainder is:
(A) 0 (B) -2 (C) 2 (D) -8

14. Find the quotient when $x^3 - 8$ is divided by $x - 2$.
(A) $x^2 + 2x + 4$ (B) $x^2 - 2x + 4$ (C) $x^2 + 4$ (D) $x^2 - 4$

Remainder Theorem & Applications

15. The polynomial $4x^2 - kx + 7$ leaves a remainder of -2 when divided by $x - 3$. Find the value of k.
(A) $k = -15$ (B) $k = 15$ (C) $k = 43/3$ (D) $k = 45$

16. If $2x^3 + kx^2 + 4x - 12$ and $x^3 + x^2 - 2x + k$ leave the same remainder when divided by $(x - 3)$, find the value of k.
(A) $k = 3$ (B) $k = -3$ (C) $k = 27$ (D) $k = -27$

17. Find the value of k if $p(x) = (3x-2)(x-k) - 8$ is divided by $(x-2)$ leaving the remainder 4.
(A) $k = 1$ (B) $k = -1$ (C) $k = 2$ (D) $k = -2$

18. Let R_1 and R_2 be the remainders when $x^3 + 2x^2 - 5ax - 7$ and $x^3 + ax^2 - 12x + 6$ are divided by $x+1$ and $x-2$ respectively. If $2R_1 + R_2 = 6$, find the value of a.
(A) $a = -2$ (B) $a = 1$ (C) $a = 6/7$ (D) $a = 2$

19. If the polynomials ax^3+4x^2+3x-4 and x^3-4x+a leave the same remainder when divided by $(x-3)$, find the value of a.
(A) $a = 1$ (B) $a = -1$ (C) $a = 2$ (D) $a = -2$

20. Find the value of k if the remainder is -3 when $kx^3 + 8x^2 - 4x + 10$ is divided by $x+1$.
(A) $k = -25$ (B) $k = 25$ (C) $k = 21$ (D) $k = -21$

21. What number should be added to x^2+5 so that the resulting polynomial leaves the remainder 3 when divided by $x+3$?
(A) 11 (B) -11 (C) 14 (D) -14

22. What is the remainder when $x^{2018} + 2018$ is divided by $(x-1)$?
(A) 2017 (B) 2018 (C) 1 (D) 2019

23. A polynomial $p(x)$ when divided by $(x-1)$, $(x+1)$ and $(x+2)$ gives remainder 5, 7 and 2 respectively. If $p(x)$ is divided by (x^2-1), the remainder is $R(x)$. Find $R(50)$.
(A) 34 (B) -44 (C) 44 (D) 104

24. Using the same $p(x)$ as in the previous question, if $p(x)$ is divided by $(x-1)(x+2)$, the remainder is $r(x)$. Find $r(100)$.
(A) 34 (B) 44 (C) 54 (D) 104

25. When a polynomial f(x) is divided by $(x-1)$ the remainder is 5 and when it is divided by $(x-2)$, the remainder is 7. Find the remainder when it is divided by $(x-1)(x-2)$.
(A) $2x-3$ (B) $2x+3$ (C) $3x+2$ (D) $3x-2$

26. Find remainder when $f(x) = x^5 - x^3 + 3x^2 + 3x + 1$ is divided by (x^2-1).
(A) $3x-4$ (B) $3x+4$ (C) $4x+3$ (D) $4x-3$

27. A polynomial $f(x)$ when divided by x^2-3x+2 leaves the remainder $ax+b$. If $f(1) = 4$ and $f(2) = 7$, determine a and b.
(A) $a = 3, b = -1$ (B) $a = -3, b = 1$ (C) $a = -3, b = -1$ (D) $a = 3, b = 1$

Factor Theorem & Finding Zeros

28. Find the value of m, if $x = 1/2$ is one of the zeroes of the polynomial $p(x) = 4x^4 - 4x^3 - mx^2 + 12x - 3$.
(A) $m = -11$ (B) $m = 5$ (C) $m = 11$ (D) $m = -5$

29. Obtain all zeros of $f(x) = 2x^4 + x^3 - 14x^2 - 19x - 6$, if two of its zeros are -2 and -1. The other two zeros are:
(A) $3, 1/2$ (B) $-3, 1/2$ (C) $3, -1/2$ (D) $-3, -1/2$

30. Obtain all zeros of $f(x) = x^3 + 13x^2 + 32x + 20$, if one of its zeros is -2. The other two zeros are:
(A) $1, 10$ (B) $-1, 10$ (C) $1, -10$ (D) $-1, -10$

31. Obtain all zeros of $f(x) = x^4 - 3x^3 - x^2 + 9x - 6$ if two of its zeros are $-\sqrt{3}$ and $\sqrt{3}$. The other two zeros are:
(A) $-1, -2$ (B) $1, 2$ (C) $-1, 2$ (D) $1, -2$

32. Find all the zeroes of the polynomial $x^4+x^3-34x^2-4x+120$, if two of its zeroes are 2 and -2. The other two zeros are:
(A) $6, 5$ (B) $-6, 5$ (C) $6, -5$ (D) $-6, -5$

33. Find the values of l and m if $8x^3 + lx^2 - 27x + m$ is divisible by $2x^2 - x - 6$.
(A) $l = 1, m = 18$ (B) $l = 1, m = -18$ (C) $l = -1, m = 18$ (D) $l = 2, m = -18$

34. Find l and m if $2x^3 - (2l+1)x^2 + (l+m)x + m$ may be exactly divisible by $2x^2 - x - 3$.
(A) $l = 1, m = 3$ (B) $l = 1, m = -3$ (C) $l = -1, m = 3$ (D) $l = -1, m = -3$

35. Obtain all zeros of $f(x) = x^4 + x^3 - 34x^2 - 4x + 120$, if two of its zeros are 2 and -2. The other two zeros are:
(A) $6, 5$ (B) $-6, 5$ (C) $6, -5$ (D) $-6, -5$

Answer Key

1	(D)	**2**	(B)	**3**	(C)	**4**	(A)	**5**	(A)	**6**	(D)	**7**	(B)	**8**	(A)	**9**	(B)	**10**	(C)
11	(A)	**12**	(C)	**13**	(B)	**14**	(A)	**15**	(B)	**16**	(B)	**17**	(B)	**18**	(D)	**19**	(B)	**20**	(B)
21	(B)	**22**	(D)	**23**	(B)	**24**	(D)	**25**	(B)	**26**	(B)	**27**	(D)	**28**	(C)	**29**	(C)	**30**	(D)
31	(B)	**32**	(B)	**33**	(D)	**34**	(D)	**35**	(B)										