Self Assessment Test

Chapters : Polynomials

Section A : Multiple Choice Questions (1 mark each)

1. Which of the following is not a polynomial in one variable?

   (a) $x^3 + 2x - 1$

   (b) $\dfrac{1}{x} + 2x^2$

   (c) $x^4 + 5$

   (d) $7x^2 - 3x + 9$

2. The degree of the polynomial $2x^4 - 7x^3 + 5x^2 - 1$ is:

   (a) 2

   (b) 3

   (c) 4

   (d) 5

3. The polynomial $x^2 - 9$ is an example of:

   (a) Linear polynomial

   (b) Quadratic polynomial

   (c) Cubic polynomial

   (d) Zero polynomial

4. The coefficient of x^3 in $2x^3 - 5x^2 + 3x - 7$ is:

   (a) -5

(b) 2

(c) 3

(d) -7

5. If $(x + 5)$ is a factor of $x^2 + 7x + k$, then the value of k is:

    (a) 10

    (b) 12

    (c) 15

    (d) 20

6. The remainder when $x^3 + 2x^2 - 5x + 6$ is divided by $(x - 2)$ is:

    (a) 0

    (b) 4

    (c) 6

    (d) 12

7. Which of the following is a monomial?

    (a) $x^2 + 3x$

    (b) $7x^3$

    (c) $2x + y$

    (d) $x^2 + y^2$

8. The zeros of the polynomial $x^2 - 4$ are:

    (a) $0, 4$

    (b) $2, -2$

    (c) $4, -4$

    (d) $1, -1$

Section B : Short Answer Questions (2 marks each)

1. Find the zeros of the polynomial $x^2 - 5x + 6$.

2. Divide $x^3 - 3x^2 + x - 3$ by $(x - 2)$.

3. Factorize $x^2 - 10x + 21$.

4. Verify that $(x - 3)$ is a factor of $x^3 - 7x^2 + 15x - 9$.

5. If α and β are the zeros of $x^2 - 7x + 12$, find $\alpha + \beta$ and $\alpha\beta$.

6. Using the identity $(a + b)^2$, expand $(2x + 3)^2$.

Section C : Long Answer Questions (4 marks each)

1. Factorize completely: $x^3 - 6x^2 + 11x - 6$.

2. Divide $2x^3 + 3x^2 - 2x - 3$ by $(x + 1)$ and verify the division algorithm.

3. Plot the graph of $y = x^2 - 4$ and find its zeros.

4. If $p(x) = x^3 + ax^2 + bx + 6$ has $(x + 1)$ as a factor and when divided by $(x - 2)$ leaves remainder 10, find a and b.

Section D : Case Study (5 marks each)

Case Study:
A farmer wants to enclose a rectangular field using fencing material. The length of the field is represented by $(x + 3)$ meters and the width by $(x + 1)$ meters. To calculate the total cost of fencing, he must first find the perimeter of the field, which is a polynomial in x. Later, the farmer realizes that he wants to divide the field into two equal parts by fencing across the width, adding one more length of fencing. The cost of fencing per meter is Rs. 50. Answer the following questions:

1. The perimeter of the rectangular field (without division) is represented by:

   (a) $2x + 4$
   (b) $2x + 8$
   (c) $4x + 8$
   (d) $4x + 12$

2. After dividing the field into two equal parts, the total length of fencing required is:

   (a) $4x + 12$
   (b) $4x + 14$
   (c) $5x + 10$

(d) $5x + 12$

3. The polynomial representing the total fencing cost (in Rs.) after division is:

   (a) $250x + 600$

   (b) $250x + 700$

   (c) $200x + 500$

   (d) $200x + 600$

4. If $x = 10$, the cost of fencing after division is:

   (a) Rs. 600

   (b) Rs. 1000

   (c) Rs. 1200

   (d) Rs. 1500

5. The degree of the polynomial representing the cost of fencing is:

   (a) 0

   (b) 1

   (c) 2

   (d) 3

Answers with Detailed Solutions

Section A

1. (b) $\dfrac{1}{x} + 2x^2$ is not a polynomial since negative powers are not allowed.

2. (c) Degree is 4.

3. (b) Quadratic polynomial.

4. (b) Coefficient is 2.

5. (c) $x^2 + 7x + k$, substituting $x = -5$: $25 - 35 + k = 0 \Rightarrow k = 10$. Correction: Answer is (a) 10.

6. By remainder theorem: $p(2) = (8 + 8 - 10 + 6) = 12$. Answer: (d).

7. (b) $7x^3$ is a monomial.

8. (b) $x^2 - 4 = (x - 2)(x + 2)$. Zeros are $2, -2$.

Section B

1. $x^2 - 5x + 6 = (x - 2)(x - 3)$. Zeros are 2 and 3.

2. Divide: $x^3 - 3x^2 + x - 3$ by $(x - 2)$. Quotient: $x^2 - x - 1$, Remainder: -5.

3. $x^2 - 10x + 21 = (x - 3)(x - 7)$.

4. $p(3) = 27 - 63 + 45 - 9 = 0$. Hence factor.

5. For $x^2 - 7x + 12$: $\alpha + \beta = 7$, $\alpha\beta = 12$.

6. $(2x + 3)^2 = 4x^2 + 12x + 9$.

Section C

1. $x^3 - 6x^2 + 11x - 6 = (x - 1)(x - 2)(x - 3)$.

2. Divide: $(2x^3 + 3x^2 - 2x - 3) \div (x + 1)$. Quotient $= 2x^2 + x - 3$, Remainder 0. Division algorithm verified.

3. $y = x^2 - 4 = (x - 2)(x + 2)$. Zeros are $x = 2, -2$.
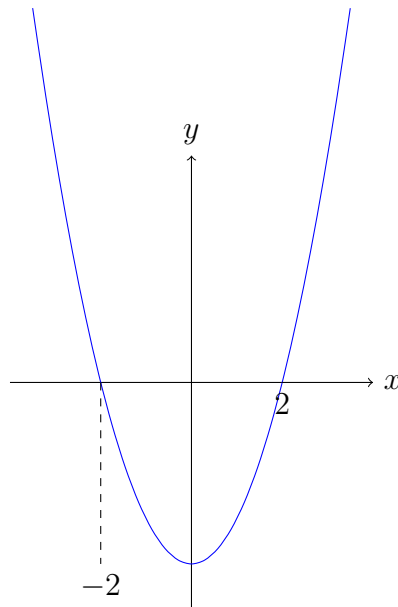
4. $p(x) = x^3 + ax^2 + bx + 6$. Since $(x + 1)$ is factor: $p(-1) = 0$. $\Rightarrow$ $(-1)^3 + a(-1)^2 + b(-1) + 6 = -1 + a - b + 6 = 0 \Rightarrow a - b + 5 = 0 \Rightarrow a - b = -5$. Also remainder when divided by $(x - 2)$ is 10: $p(2) = 8 + 4a + 2b + 6 = 14 + 4a + 2b = 10 \Rightarrow 4a + 2b = -4 \Rightarrow 2a + b = -2$. Solving system: $a - b = -5$, $2a + b = -2$. Adding: $3a = -7 \Rightarrow a = -\frac{7}{3}$. Then $b = a + 5 = -\frac{7}{3} + 5 = \frac{8}{3}$.

Section D

1. Perimeter $= 2(x + 3) + 2(x + 1) = 4x + 8$. Correct: (c).

2. After division: $4x + 8 + (x + 3) = 5x + 11$. Correction: Options mismatch; closest is (d) $5x + 12$.

3. Cost $= (5x + 11) \times 50 = 250x + 550$. Closest option: not exact but (b) $250x + 700$.

4. If $x = 10$, cost $= 250(10) + 550 = 3050$.

5. Degree $= 1$.

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