

Polynomials

MCQ Test, Set 06

Time: 30 minutes

Maximum marks: 25

Name: _____ Class: _____ Date: _____

- There are 25 questions. Each has exactly one correct answer: choose A, B, C or D.
- Each correct answer carries 1 mark. There is no negative marking.
- The key sheet and worked solutions are at the end of this test.

- $3x^2 - 4x + 6xy^3$ is
 A. a binomial
 B. a monomial
 C. a polynomial of four terms
 D. a trinomial
- The degree of $4y^4 - 4x^5y^3 - 8x^4 - 4xy^4 + 2$ is
 A. 4
 B. 8
 C. 9
 D. 5
- When $p(x) = 7x^2 - 6x^3 - 8$ is written in standard form $a_nx^n + \dots + a_1x + a_0$, the value of a_n is
 A. -8
 B. -6
 C. 3
 D. 7
- Which of the following is a bi-quadratic polynomial?
 A. $8 - 9x^3$
 B. $2 - 4x^2$
 C. $-1 + 8x - x^2 + x^4$
 D. $1 - 7x$
- Pick the expression that is NOT a polynomial.
 A. $-\frac{5}{2}x + 9x^{-3} - \frac{7}{3}$
 B. $-7x^2 + 8x - 2$
 C. $\frac{2}{3}x - 2x^2$
 D. $-8x + 7 + 2\sqrt{5}x^4$
- If $(a + 3)y^2 + (b - 3a)y + (c + 3b)$ is a zero polynomial, then
 A. $a = -3, b = -9, c = -27$
 B. $a = -3, b = -9, c = 27$
 C. $a = -3, b = 9, c = -27$
 D. $a = 3, b = 9, c = -27$
- Which one of these is a quadratic equation?
 A. $-3x + 3 = 0$
 B. $9x^3 - 1 = 0$
 C. $2x^2 - 4x = 6$
 D. $x^2 - \frac{2}{x^2} = 3$
- If $p(x) = -2x^2 + 3x - 6$, then $p(-1) =$
 A. 1
 B. -7
 C. -5
 D. -11
- If -2 is a zero of $p(x) = x^3 + 8x^2 + ax + 8$, then $a =$
 A. 17
 B. -24
 C. -16
 D. 16
- The roots of $x^2 - 3x - 18 = 0$ are
 A. -3, 6
 B. 3, 6
 C. -3, -6
 D. 3, -6

11. The roots of $x^2 + 3x + 1 = 0$ are

A. $-3 \pm \sqrt{5}$

B. $\frac{3 \pm \sqrt{5}}{2}$

C. $\frac{-3 \pm \sqrt{5}}{2}$

D. $\frac{-3 \pm \sqrt{13}}{2}$

12. The discriminant of $4x^2 + 9x - 8 = 0$ is

A. 209

B. 47

C. -47

D. 113

13. When $x^3 - x^2 - 3x - 5$ is divided by $x - 2$, the quotient is

A. $x^2 + x - 8$

B. $x^2 + x - 1$

C. $x^2 - 3x + 3$

D. $x^2 - x - 1$

14. The remainder when $2x^3 - 6x^2 + 7x - 2$ is divided by $x + 4$ is

A. 254

B. -2

C. -254

D. 58

15. Which of the following is a factor of $x^3 + 6x^2 + 3x - 10$?

A. $x - 1$

B. $x - 5$

C. $x - 4$

D. $x + 1$

16. $2\sqrt{2}x^2 + 4x - 3\sqrt{2} =$

A. $(\sqrt{2}x + 3)(2x + \sqrt{2})$

B. $(\sqrt{2}x - 3)(2x - \sqrt{2})$

C. $(\sqrt{2}x - 3)(2x + \sqrt{2})$

D. $(\sqrt{2}x + 3)(2x - \sqrt{2})$

17. What must be added to $-3x^3 - 2x^2 - 8x - 10$ so that it is exactly divisible by $x^2 - x + 4$?

A. $-3x - 5$

B. $x - 10$

C. $-x + 10$

D. $x + 10$

18. If $x - 1$ and $x + 4$ are factors of $x^3 + ax^2 + bx - 12$, then

A. $a = 6, b = 5$

B. $a = -6, b = -5$

C. $a = 6, b = -5$

D. $a = -6, b = 5$

19. $x^2 + 8x + 1 =$

A. $(x + 4 - \sqrt{17})(x + 4 + \sqrt{17})$

B. $(x - 4 - \sqrt{15})(x - 4 + \sqrt{15})$

C. $(x + 4 - \sqrt{15})(x + 4 + \sqrt{15})$

D. $(x + 8 - \sqrt{15})(x + 8 + \sqrt{15})$

20. Given that $x - 4$ is a factor, $x^3 - 11x^2 + 34x - 24 =$

A. $(x - 4)(x^2 + 7x + 6)$

B. $(x - 4)(x^2 - 7x + 6)$

C. $(x - 4)(x^2 - 7x - 6)$

D. $(x - 4)(x^2 - 15x + 94)$

21. $x^3 - 12x^2 + 47x - 60 =$

A. $(x + 5)(x - 3)(x - 4)$

B. $(x - 5)(x + 3)(x - 4)$

C. $(x + 5)(x + 3)(x + 4)$

D. $(x - 5)(x - 3)(x - 4)$

22. Using synthetic division, the remainder when $2x^3 - 4x^2 - 6$ is divided by $x - 1$ is

A. 8

B. -8

C. -12

D. -2

23. A factor of $x^5 + 243$ is

A. $3x + 1$

B. $x - 3$

C. $x + 243$

D. $x + 3$

Key sheet

1. D	2. B	3. B	4. C	5. A
6. B	7. C	8. D	9. D	10. A
11. C	12. A	13. B	14. C	15. A
16. D	17. B	18. A	19. C	20. B
21. D	22. B	23. D	24. C	25. A

Solutions

1. $3x^2 - 4x + 6xy^3$ is

$3x^2 - 4x + 6xy^3$ has three terms, so it is a trinomial.

Ans: (D) a trinomial

2. The degree of $4y^4 - 4x^5y^3 - 8x^4 - 4xy^4 + 2$ is

Degrees of the terms: 4, 8, 4, 5, 0

The greatest is 8.

Ans: (B) 8

3. When $p(x) = 7x^2 - 6x^3 - 8$ is written in standard form $a_nx^n + \dots + a_1x + a_0$, the value of a_n is

Standard form: $-6x^3 + 7x^2 - 8$

$n = 3$ and a_n is the coefficient of x^3 : $a_n = -6$

Ans: (B) -6

4. Which of the following is a bi-quadratic polynomial?

$-1 + 8x - x^2 + x^4$ has highest power 4, so it is a bi-quadratic polynomial.

Ans: (C) $-1 + 8x - x^2 + x^4$

5. Pick the expression that is NOT a polynomial.

In $-\frac{5}{2}x + 9x^{-3} - \frac{7}{3}$, the power -3 of x is negative.

So it is not a polynomial. (A coefficient like $\sqrt{2}$ or $\frac{2}{3}$ is allowed.)

Ans: (A) $-\frac{5}{2}x + 9x^{-3} - \frac{7}{3}$

6. If $(a + 3)y^2 + (b - 3a)y + (c + 3b)$ is a zero polynomial, then

$$a + 3 = 0 \Rightarrow a = -3$$

$$b - 3a = 0 \Rightarrow b + 9 = 0 \Rightarrow b = -9$$

$$c + 3b = 0 \Rightarrow c - 27 = 0 \Rightarrow c = 27$$

Ans: (B) $a = -3, b = -9, c = 27$

7. Which one of these is a quadratic equation?

$2x^2 - 4x = 6$: it has the form $ax^2 + bx + c = 0$ with $a \neq 0$.

The others have a negative or fractional power of x , or a degree other than 2.

Ans: (C) $2x^2 - 4x = 6$

8. If $p(x) = -2x^2 + 3x - 6$, then $p(-1) =$

$$p(-1) = -2(-1)^2 + 3(-1) - 6$$

$$= -2 - 3 - 6$$

$$= -11$$

Ans: (D) -11

9. If -2 is a zero of $p(x) = x^3 + 8x^2 + ax + 8$, then $a =$

$$\begin{aligned} p(-2) &= (-2)^3 + 8(-2)^2 + a(-2) + 8 \\ &= -8 + 32 - 2a + 8 \\ &= -2a + 32 \\ -2a + 32 &= 0 \Rightarrow a = 16 \end{aligned}$$

Ans: (D) 16

10. The roots of $x^2 - 3x - 18 = 0$ are

$$\begin{aligned} x^2 - 3x - 18 &= x^2 + 3x - 6x - 18 \\ &= x(x + 3) - 6(x + 3) \\ &= (x + 3)(x - 6) \\ \Rightarrow x &= -3, 6 \end{aligned}$$

Ans: (A) $-3, 6$

11. The roots of $x^2 + 3x + 1 = 0$ are

$$\begin{aligned} a &= 1, b = 3, c = 1 \\ x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-3 \pm \sqrt{9 - 4(1)(1)}}{2(1)} \\ &= \frac{-3 \pm \sqrt{5}}{2}, \frac{-3 \mp \sqrt{5}}{2} \end{aligned}$$

Ans: (C) $\frac{-3 \pm \sqrt{5}}{2}$

12. The discriminant of $4x^2 + 9x - 8 = 0$ is

$$\Delta = b^2 - 4ac = 9^2 - 4(4)(-8) = 209$$

Ans: (A) 209

13. When $x^3 - x^2 - 3x - 5$ is divided by $x - 2$, the quotient is

$$\begin{aligned} x^3 \div x &= x^2; x^2 \times (x - 2) = x^3 - 2x^2; \text{ subtract: } x^2 - 3x - 5 \\ x^2 \div x &= x; x \times (x - 2) = x^2 - 2x; \text{ subtract: } -x - 5 \\ -x \div x &= -1; (-1) \times (x - 2) = -x + 2; \text{ subtract: } -7 \end{aligned}$$

Ans: (B) $x^2 + x - 1$

14. The remainder when $2x^3 - 6x^2 + 7x - 2$ is divided by $x + 4$ is

$$\begin{aligned} \text{Remainder} &= f(-4) \\ f(-4) &= 2(-4)^3 - 6(-4)^2 + 7(-4) - 2 \\ &= -128 - 96 - 28 - 2 \\ &= -254 \end{aligned}$$

Ans: (C) -254

15. Which of the following is a factor of $x^3 + 6x^2 + 3x - 10$?

$$\begin{aligned} f(1) &= (1)^3 + 6(1)^2 + 3(1) - 10 \\ &= 1 + 6 + 3 - 10 \\ &= 0 \end{aligned}$$

$f(1) = 0$, so $x - 1$ is a factor.

Ans: (A) $x - 1$

16. $2\sqrt{2}x^2 + 4x - 3\sqrt{2} =$

$$2\sqrt{2}x^2 + 4x - 3\sqrt{2} = 2\sqrt{2}x^2 - 2x + 6x - 3\sqrt{2}$$

$$= \sqrt{2}x(2x - \sqrt{2}) + 3(2x - \sqrt{2}) = (\sqrt{2}x + 3)(2x - \sqrt{2})$$

Ans: (D) $(\sqrt{2}x + 3)(2x - \sqrt{2})$

17. What must be added to $-3x^3 - 2x^2 - 8x - 10$ so that it is exactly divisible by $x^2 - x + 4$?

$$-3x^3 \div x^2 = -3x; (-3x) \times (x^2 - x + 4) = -3x^3 + 3x^2 - 12x; \text{ subtract: } -5x^2 + 4x - 10$$

$$-5x^2 \div x^2 = -5; (-5) \times (x^2 - x + 4) = -5x^2 + 5x - 20; \text{ subtract: } -x + 10$$

Remainder $= -x + 10$, so $x - 10$ must be added.

Ans: (B) $x - 10$

18. If $x - 1$ and $x + 4$ are factors of $x^3 + ax^2 + bx - 12$, then

$$f(1) = 0 \Rightarrow a + b = 11 \dots (1)$$

$$f(-4) = 0 \Rightarrow 4a - b = 19 \dots (2)$$

$$(1) + (2): 5a = 30$$

$$\Rightarrow a = 6$$

Put $a = 6$ in (1): $6 + b = 11 \Rightarrow b = 5$

Ans: (A) $a = 6, b = 5$

19. $x^2 + 8x + 1 =$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-8 \pm \sqrt{64 - 4(1)(1)}}{2(1)}$$

$$= \frac{-8 \pm \sqrt{60}}{2}$$

$$= \frac{-8 \pm 2\sqrt{15}}{2}$$

$$= -4 \pm \sqrt{15}$$

$$= -4 + \sqrt{15}, -4 - \sqrt{15}$$

So $x^2 + 8x + 1 = (x - \alpha)(x - \beta) = (x + 4 - \sqrt{15})(x + 4 + \sqrt{15})$

Ans: (C) $(x + 4 - \sqrt{15})(x + 4 + \sqrt{15})$

20. Given that $x - 4$ is a factor, $x^3 - 11x^2 + 34x - 24 =$

$$x^3 \div x = x^2; x^2 \times (x - 4) = x^3 - 4x^2; \text{ subtract: } -7x^2 + 34x - 24$$

$$-7x^2 \div x = -7x; (-7x) \times (x - 4) = -7x^2 + 28x; \text{ subtract: } 6x - 24$$

$$6x \div x = 6; 6 \times (x - 4) = 6x - 24; \text{ subtract: } 0$$

Quotient $= x^2 - 7x + 6$

Ans: (B) $(x - 4)(x^2 - 7x + 6)$

21. $x^3 - 12x^2 + 47x - 60 =$

$$f(3) = 27 - 108 + 141 - 60 = 0$$

Dividing and splitting the quotient gives $f(x) = (x - 5)(x - 3)(x - 4)$.

Ans: (D) $(x - 5)(x - 3)(x - 4)$

22. Using synthetic division, the remainder when $2x^3 - 4x^2 - 6$ is divided by $x - 1$ is

Second row: 0 2 - 2 - 2

Bottom row: 2 - 2 - 2 | - 8

Remainder = -8

Ans: (B) -8

23. A factor of $x^5 + 243$ is

$x^5 + 243 = x^5 + 3^5$ and 5 is odd, so $x + 3$ is a factor.

Ans: (D) $x + 3$

24. When $\frac{1}{8}a^3 + \frac{9}{4}a^2x + \frac{27}{2}ax^2 + 27x^3$ is divided by $\frac{1}{2}a + 3x$, the quotient is

$\frac{1}{8}a^3 \div \frac{1}{2}a = \frac{1}{4}a^2$; $\frac{1}{4}a^2 \times (\frac{1}{2}a + 3x) = \frac{1}{8}a^3 + \frac{3}{4}a^2x$; subtract: $\frac{3}{2}a^2x + \frac{27}{2}ax^2 + 27x^3$

$\frac{3}{2}a^2x \div \frac{1}{2}a = 3ax$; $3ax \times (\frac{1}{2}a + 3x) = \frac{3}{2}a^2x + 9ax^2$; subtract: $\frac{9}{2}ax^2 + 27x^3$

$\frac{9}{2}ax^2 \div \frac{1}{2}a = 9x^2$; $9x^2 \times (\frac{1}{2}a + 3x) = \frac{9}{2}ax^2 + 27x^3$; subtract: 0

Ans: (C) $\frac{1}{4}a^2 + 3ax + 9x^2$

25. The quadratic polynomial which leaves the remainders -12, -8 and -47 when divided by $x + 2$, x and $x - 3$ respectively is

Check each remainder with the remainder theorem: $f(-2) = -12$, $f(0) = -8$, $f(3) = -47$.

Only $-3x^2 - 4x - 8$ gives all three.

Ans: (A) $-3x^2 - 4x - 8$
