

Polynomials

MCQ Test, Set 10

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.

1. Identify the monomial among these.

- A.** $9\sqrt{xy}$ **B.** $-2xy$ **C.** $2x^{-2}y^4$ **D.** $-5x^{-1}y$

2. The degree of $9x^2y^2 + 2y - 4x^2 + 7x^2y^4 + 5$ is

- A.** 5 **B.** 7 **C.** 6 **D.** 4

3. When $p(x) = 8x^4 - 7 - 3x^6 - 9x^3$ is written in standard form $a_nx^n + \dots + a_1x + a_0$, the value of a_n is

- A.** 8 **B.** 6 **C.** -7 **D.** -3

4. Pick the cubic polynomial.

- A.** $6 - 9x^2 + 7x + 4x^3$ **B.** $6x^3 - 9 - 6x + x^4$ **C.** $8x + x^2 + 1$ **D.** $3 - 7x$

5. Identify the expression which is not a polynomial.

- A.** $2\sqrt{2}x^2 - 6x^4 + 4x$ **B.** $5\sqrt{3}x - \frac{1}{2} + 5x^3$
C. $4\sqrt{3}x - 3x^{-3}$ **D.** $3x^3 + \frac{1}{3}x^4$

6. If $(p - 5)y^2 + (q - 3p)y + (r - 3q)$ is a zero polynomial, then

- A.** $p = 5, q = 15, r = -45$ **B.** $p = 5, q = 15, r = 45$ **C.** $p = -5, q = -15, r = -45$ **D.** $p = 5, q = -15, r = -45$

7. Identify the quadratic equation.

- A.** $8x - 3 = 0$ **B.** $x^2 - 5\sqrt{x} + 2 = 0$
C. $4\sqrt{3}x^2 + 9x + 7\sqrt{3} = 0$ **D.** $x^2 + \frac{3}{x^2} = 2$

8. If $p(x) = -2x^2 + 5x - 1$, then $p(-1) =$

- A.** -4 **B.** -6 **C.** 2 **D.** -8

9. The zero of the polynomial $-8x + 9$ is

- A.** $-\frac{8}{9}$ **B.** $\frac{9}{8}$ **C.** $\frac{8}{9}$ **D.** $-\frac{9}{8}$

10. The roots of $x^2 - 8x + 7 = 0$ are

- A.** $1, 7$ **B.** $-1, -7$ **C.** $-1, 7$ **D.** $1, -7$

11. The discriminant of $2x^2 - 5x + 2 = 0$ is
A. 41 **B.** 9 **C.** -41 **D.** 21
-
12. The remainder when $-2x^4 - x^3 + 15x^2 + 2x + 9$ is divided by $x^2 - 2x - 2$ is
A. $6x + 11$ **B.** $-6x - 11$ **C.** $6x - 11$ **D.** $-6x + 11$
-
13. The remainder when $16x^3 + 4x^2 - 6x + 8$ is divided by $2x - 1$ is
A. 10 **B.** 22 **C.** 8 **D.** -8
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14. If $x - 1$ is a factor of $x^3 + 3x^2 - 2x + a$, then $a =$
A. -2 **B.** -4 **C.** -1 **D.** 2
-
15. $2\sqrt{2}x^2 - 16x + 15\sqrt{2} =$
A. $(\sqrt{2}x + 5)(2x + 3\sqrt{2})$ **B.** $(\sqrt{2}x + 5)(2x - 3\sqrt{2})$
C. $(\sqrt{2}x - 5)(2x + 3\sqrt{2})$ **D.** $(\sqrt{2}x - 5)(2x - 3\sqrt{2})$
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16. What must be added to $x^3 - 6x^2 - x + 4$ so that it is exactly divisible by $x + 4$?
A. -152 **B.** 32 **C.** -32 **D.** 152
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17. If $x + 3$ and $x - 2$ are factors of $x^3 + ax^2 + bx - 12$, then
A. $a = 3, b = -4$ **B.** $a = -3, b = -4$ **C.** $a = -3, b = 4$ **D.** $a = 3, b = 4$
-
18. $x^2 + 12x - 6 =$
A. $(x - 6 - \sqrt{42})(x - 6 + \sqrt{42})$ **B.** $(x + 6 - \sqrt{30})(x + 6 + \sqrt{30})$
C. $(x + 12 - \sqrt{42})(x + 12 + \sqrt{42})$ **D.** $(x + 6 - \sqrt{42})(x + 6 + \sqrt{42})$
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19. Given that $x - 2$ is a factor, $x^3 - 13x^2 + 52x - 60 =$
A. $(x - 2)(x^2 - 11x - 30)$ **B.** $(x - 2)(x^2 - 11x + 30)$
C. $(x - 2)(x^2 + 11x + 30)$ **D.** $(x - 2)(x^2 - 15x + 82)$
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20. $x^3 + 2x^2 - 11x - 12 =$
A. $(x - 3)(x + 4)(x + 1)$ **B.** $(x + 3)(x - 4)(x - 1)$ **C.** $(x - 3)(x - 4)(x + 1)$ **D.** $(x + 3)(x + 4)(x + 1)$
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21. Using synthetic division, the quotient when $4x^3 - x^2 - 2$ is divided by $x + 1$ is
A. $4x - 5$ **B.** $4x^2 - 5x + 5$ **C.** $4x^3 - 5x^2 + 5x - 7$ **D.** $4x^2 + 3x + 3$
-
22. $x^3 - 27 = (x - 3) \times$
A. $x^2 - 3x + 9$ **B.** $x^2 + 3x + 6$ **C.** $x^2 + 3x + 9$ **D.** $x^2 + 3x + 3$
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23. $39^{45} - 16^{45}$ is exactly divisible by
A. 23 **B.** 39 **C.** 16 **D.** 55
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24. When $\frac{1}{2}a^3 + \frac{7}{2}a^2x + \frac{22}{3}ax^2 + 4x^3$ is divided by $\frac{1}{3}a + x$, the quotient is

A. $\frac{3}{2}a^2 + 6ax + 4x^2$

B. $\frac{3}{2}a^2 + 4x^2$

C. $\frac{3}{2}a^2 + 6ax - 4x^2$

D. $\frac{3}{2}a^2 - 6ax + 4x^2$

25. The quadratic polynomial which leaves the remainders -15 , -1 and 3 when divided by $x + 2$, x and $x - 1$ respectively is

A. $x^2 + 5x - 1$

B. $-x^2 + 5x + 1$

C. $-x^2 + 5x - 1$

D. $-x^2 - 5x - 1$

Key sheet

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

Solutions

1. Identify the monomial among these.

$-2xy$: the powers of x and y are 1 and 1, non-negative integers, so it is a monomial.
Each of the others has a negative or fractional power.

Ans: (B) $-2xy$

2. The degree of $9x^2y^2 + 2y - 4x^2 + 7x^2y^4 + 5$ is

Degrees of the terms: 4, 1, 2, 6, 0

The greatest is 6.

Ans: (C) 6

3. When $p(x) = 8x^4 - 7 - 3x^6 - 9x^3$ is written in standard form $a_nx^n + \dots + a_1x + a_0$, the value of a_n is

Standard form: $-3x^6 + 8x^4 - 9x^3 - 7$

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

Ans: (D) -3

4. Pick the cubic polynomial.

$6 - 9x^2 + 7x + 4x^3$ has highest power 3, so it is a cubic polynomial.

Ans: (A) $6 - 9x^2 + 7x + 4x^3$

5. Identify the expression which is not a polynomial.

In $4\sqrt{3}x - 3x^{-3}$, 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: (C) $4\sqrt{3}x - 3x^{-3}$

6. If $(p - 5)y^2 + (q - 3p)y + (r - 3q)$ is a zero polynomial, then

$$p - 5 = 0 \Rightarrow p = 5$$

$$q - 3p = 0 \Rightarrow q - 15 = 0 \Rightarrow q = 15$$

$$r - 3q = 0 \Rightarrow r - 45 = 0 \Rightarrow r = 45$$

Ans: (B) $p = 5, q = 15, r = 45$

7. Identify the quadratic equation.

$4\sqrt{3}x^2 + 9x + 7\sqrt{3} = 0$: 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) $4\sqrt{3}x^2 + 9x + 7\sqrt{3} = 0$

8. If $p(x) = -2x^2 + 5x - 1$, then $p(-1) =$

$$p(-1) = -2(-1)^2 + 5(-1) - 1$$

$$= -2 - 5 - 1$$

$$= -8$$

Ans: (D) -8

9. The zero of the polynomial $-8x + 9$ is

$$-8x + 9 = 0 \Rightarrow -8x = -9 \Rightarrow x = \frac{9}{8}$$

Ans: (B) $\frac{9}{8}$

10. The roots of $x^2 - 8x + 7 = 0$ are

$$x^2 - 8x + 7 = x^2 - x - 7x + 7$$

$$= x(x - 1) - 7(x - 1)$$

$$= (x - 1)(x - 7)$$

$$\Rightarrow x = 1, 7$$

Ans: (A) 1, 7

11. The discriminant of $2x^2 - 5x + 2 = 0$ is

$$\Delta = b^2 - 4ac = (-5)^2 - 4(2)(2) = 9$$

Ans: (B) 9

12. The remainder when $-2x^4 - x^3 + 15x^2 + 2x + 9$ is divided by $x^2 - 2x - 2$ is

$$-2x^4 \div x^2 = -2x^2; (-2x^2) \times (x^2 - 2x - 2) = -2x^4 + 4x^3 + 4x^2; \text{ subtract: } -5x^3 + 11x^2 + 2x + 9$$

$$-5x^3 \div x^2 = -5x; (-5x) \times (x^2 - 2x - 2) = -5x^3 + 10x^2 + 10x; \text{ subtract: } x^2 - 8x + 9$$

$$x^2 \div x^2 = 1; 1 \times (x^2 - 2x - 2) = x^2 - 2x - 2; \text{ subtract: } -6x + 11$$

$$\text{Remainder} = -6x + 11$$

Ans: (D) $-6x + 11$

13. The remainder when $16x^3 + 4x^2 - 6x + 8$ is divided by $2x - 1$ is

$$2x - 1 = 0 \Rightarrow x = \frac{1}{2}; \text{ remainder} = f\left(\frac{1}{2}\right)$$

$$= 8$$

Ans: (C) 8

14. If $x - 1$ is a factor of $x^3 + 3x^2 - 2x + a$, then $a =$

$$f(1) = (1)^3 + 3(1)^2 - 2(1) + a$$

$$= 1 + 3 - 2 + a$$

$$= a + 2$$

$$a + 2 = 0 \Rightarrow a = -2$$

Ans: (A) -2

15. $2\sqrt{2}x^2 - 16x + 15\sqrt{2} =$

$$2\sqrt{2}x^2 - 16x + 15\sqrt{2} = 2\sqrt{2}x^2 - 6x - 10x + 15\sqrt{2}$$

$$= \sqrt{2}x(2x - 3\sqrt{2}) - 5(2x - 3\sqrt{2}) = (\sqrt{2}x - 5)(2x - 3\sqrt{2})$$

Ans: (D) $(\sqrt{2}x - 5)(2x - 3\sqrt{2})$

16. What must be added to $x^3 - 6x^2 - x + 4$ so that it is exactly divisible by $x + 4$?

Remainder = $f(-4)$ (remainder theorem)

$$f(-4) = (-4)^3 - 6(-4)^2 - (-4) + 4$$

$$= -64 - 96 + 4 + 4$$

$$= -152$$

The remainder is -152 , so 152 must be added.

Ans: (D) 152

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

$$f(-3) = 0 \Rightarrow 3a - b = 13 \dots (1)$$

$$f(2) = 0 \Rightarrow 2a + b = 2 \dots (2)$$

$$(1) + (2): 5a = 15$$

$$\Rightarrow a = 3$$

$$\text{Put } a = 3 \text{ in (1): } 9 - b = 13 \Rightarrow b = -4$$

Ans: (A) $a = 3, b = -4$

18. $x^2 + 12x - 6 =$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{-12 \pm \sqrt{144 - 4(1)(-6)}}{2(1)}$$

$$= \frac{-12 \pm \sqrt{168}}{2}$$

$$= \frac{-12 \pm 2\sqrt{42}}{2}$$

$$= -6 \pm \sqrt{42}$$

$$= -6 + \sqrt{42}, -6 - \sqrt{42}$$

$$\text{So } x^2 + 12x - 6 = (x - \alpha)(x - \beta) = (x + 6 - \sqrt{42})(x + 6 + \sqrt{42})$$

Ans: (D) $(x + 6 - \sqrt{42})(x + 6 + \sqrt{42})$

19. Given that $x - 2$ is a factor, $x^3 - 13x^2 + 52x - 60 =$

$$x^3 \div x = x^2; x^2 \times (x - 2) = x^3 - 2x^2; \text{ subtract: } -11x^2 + 52x - 60$$

$$-11x^2 \div x = -11x; (-11x) \times (x - 2) = -11x^2 + 22x; \text{ subtract: } 30x - 60$$

$$30x \div x = 30; 30 \times (x - 2) = 30x - 60; \text{ subtract: } 0$$

$$\text{Quotient} = x^2 - 11x + 30$$

Ans: (B) $(x - 2)(x^2 - 11x + 30)$

20. $x^3 + 2x^2 - 11x - 12 =$

$$f(-1) = -1 + 2 + 11 - 12 = 0$$

Dividing and splitting the quotient gives $f(x) = (x - 3)(x + 4)(x + 1)$.

Ans: (A) $(x - 3)(x + 4)(x + 1)$

21. Using synthetic division, the quotient when $4x^3 - x^2 - 2$ is divided by $x + 1$ is

$$\text{Second row: } 0 \quad -4 \quad 5 \quad -5$$

$$\text{Bottom row: } 4 \quad -5 \quad 5 \mid -7$$

$$\text{Quotient} = 4x^2 - 5x + 5$$

Ans: (B) $4x^2 - 5x + 5$

22. $x^3 - 27 = (x - 3) \times$

$$x^3 - 27 = (x - 3)(x^2 + 3x + 9)$$

Signs are all +; the powers of 3 go up as the powers of x go down.

Ans: (C) $x^2 + 3x + 9$

23. $39^{45} - 16^{45}$ is exactly divisible by

$n = 45$: $x - a$ is a factor of $x^n - a^n$ (n odd).

So $39 - 16 = 23$ divides it.

Ans: (A) 23

24. When $\frac{1}{2}a^3 + \frac{7}{2}a^2x + \frac{22}{3}ax^2 + 4x^3$ is divided by $\frac{1}{3}a + x$, the quotient is

$$\frac{1}{2}a^3 \div \frac{1}{3}a = \frac{3}{2}a^2; \frac{3}{2}a^2 \times (\frac{1}{3}a + x) = \frac{1}{2}a^3 + \frac{3}{2}a^2x; \text{ subtract: } 2a^2x + \frac{22}{3}ax^2 + 4x^3$$

$$2a^2x \div \frac{1}{3}a = 6ax; 6ax \times (\frac{1}{3}a + x) = 2a^2x + 6ax^2; \text{ subtract: } \frac{4}{3}ax^2 + 4x^3$$

$$\frac{4}{3}ax^2 \div \frac{1}{3}a = 4x^2; 4x^2 \times (\frac{1}{3}a + x) = \frac{4}{3}ax^2 + 4x^3; \text{ subtract: } 0$$

Ans: (A) $\frac{3}{2}a^2 + 6ax + 4x^2$

25. The quadratic polynomial which leaves the remainders -15 , -1 and 3 when divided by $x + 2$, x and $x - 1$ respectively is

Check each remainder with the remainder theorem: $f(-2) = -15$, $f(0) = -1$, $f(1) = 3$.

Only $-x^2 + 5x - 1$ gives all three.

Ans: (C) $-x^2 + 5x - 1$
