

Polynomials

MCQ Test, Set 02

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. Which of the following is not a monomial?

- A. $3x^5y$ B. $\frac{2}{5}x^4y^3$ C. $\frac{2}{5}x^3$ D. $-7x^{\frac{1}{2}}y$

2. The degree of $3x^2y - 9x^6 + 8x^2 + 5$ is

- A. 7 B. 3 C. 4 D. 6

3. When $p(x) = 6 - 9x^2 + 7x^4 - 5x^3$ is written in standard form $a_nx^n + \dots + a_1x + a_0$, the value of a_n is

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

4. Which of the following is a cubic polynomial?

- A. $-1 + 3x + 4x^2$ B. $-4 + 5x^3 - 3x$ C. $-6 + 6x^4$ D. $-1 + 7x$

5. Which of the following is not a polynomial?

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

6. If $(a + 5)x^2 + (b - 2a)x + (c + 3b)$ is a zero polynomial, then

- A. $a = 5, b = 10, c = -30$ B. $a = -5, b = -10, c = -30$ C. $a = -5, b = 10, c = -30$ D. $a = -5, b = -10, c = 30$

7. Which of the following is a quadratic equation?

- A. $6x^2 - 6x - 4 = 0$ B. $-5x^3 + 7x^2 - 7x + 6 = 0$
 C. $-4x - 7 = 0$ D. $x^2 - 7\sqrt{x} + 7 = 0$

8. If $p(x) = -3x^3 - 2x^2 - 6x + 4$, then $p(-3) =$

- A. 85 B. 49 C. 121 D. -113

9. If 4 is a zero of $p(x) = x^2 - ax + 4$, then $a =$

- A. 6 B. 5 C. 3 D. -5

10. The roots of $8x^2 - 30x + 25 = 0$ are

A. 5, 5

B. $-\frac{5}{4}, -\frac{5}{2}$

C. $\frac{4}{5}, \frac{2}{5}$

D. $\frac{5}{4}, \frac{5}{2}$

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

A. $\frac{-5 \pm \sqrt{31}}{2}$

B. $\frac{5 \pm \sqrt{19}}{2}$

C. $\frac{5 \pm \sqrt{31}}{2}$

D. $5 \pm \sqrt{31}$

12. A polynomial of degree 8 is divided by a polynomial of degree 3. The degree of the quotient is

A. 3

B. 5

C. 24

D. 11

13. The remainder when $24x^3 - 4x^2 - 8x + 3$ is divided by $2x + 3$ is

A. -657

B. 75

C. -75

D. 63

14. If $x - 1$ is a factor of $x^3 - 6x^2 + ax + 2$, then $a =$

A. 3

B. -5

C. -3

D. 4

15. If $24x^4 - ax^3 - x^2 - x - 2$ is divisible by $2x + 1$, then $a =$

A. -10

B. -22

C. -2

D. 2

16. $7\sqrt{3}x^2 - 29x - 10\sqrt{3} =$

A. $(\sqrt{3}x + 5)(7x - 2\sqrt{3})$

B. $(\sqrt{3}x + 5)(7x + 2\sqrt{3})$

C. $(\sqrt{3}x - 5)(7x - 2\sqrt{3})$

D. $(\sqrt{3}x - 5)(7x + 2\sqrt{3})$

17. What must be added to $-4x^3 + x^2 - 9x + 9$ so that it is exactly divisible by $x^2 + 2$?

A. $x - 7$

B. $x + 7$

C. $-4x + 1$

D. $-x + 7$

18. If $x - 2$ and $x + 4$ are factors of $x^3 + ax^2 + bx - 24$, then

A. $a = 5, b = 2$

B. $a = 5, b = -2$

C. $a = -5, b = -2$

D. $a = -5, b = 2$

19. $x^2 - 6x + 3 =$

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

B. $(x - 3 - \sqrt{6})(x - 3 + \sqrt{6})$

C. $(x + 3 - \sqrt{6})(x + 3 + \sqrt{6})$

D. $(x - 6 - \sqrt{6})(x - 6 + \sqrt{6})$

20. Given that $x - 4$ is a factor, $x^3 - 10x^2 + 29x - 20 =$

A. $(x - 4)(x^2 - 6x + 5)$

B. $(x - 4)(x^2 + 6x + 5)$

C. $(x - 4)(x^2 - 6x - 5)$

D. $(x - 4)(x^2 - 14x + 85)$

21. $x^3 - 19x - 30 =$

A. $(x - 5)(x + 2)(x + 3)$

B. $(x + 5)(x - 2)(x - 3)$

C. $(x - 5)(x - 2)(x + 3)$

D. $(x + 5)(x + 2)(x + 3)$

22. Using synthetic division, the remainder when $x^3 + 6x + 5$ is divided by $x - 1$ is

A. 7

B. -2

C. 12

D. -12

23. $31^{155} + 12^{155}$ is exactly divisible by
- A. 19 B. 12 C. 43 D. 31
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24. When $a^3 - \frac{3}{2}a^2x + 7ax^2 + 4x^3$ is divided by $2a + x$, the quotient is
- A. $\frac{1}{2}a^2 - ax + 4x^2$ B. $\frac{1}{2}a^2 + 4x^2$
C. $\frac{1}{2}a^2 - ax - 4x^2$ D. $\frac{1}{2}a^2 + ax + 4x^2$
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25. The quadratic polynomial which leaves the remainders 12, 0 and -12 when divided by $x + 1$, $x - 1$ and $x - 2$ respectively is
- A. $-2x^2 + 6x + 8$ B. $-2x^2 - 6x + 8$ C. $2x^2 - 6x + 8$ D. $-2x^2 - 6x - 8$
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Key sheet

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

Solutions

1. Which of the following is not a monomial?

The power $\frac{1}{2}$ of x is not a whole number.

So $-7x^{\frac{1}{2}}y$ is not a monomial; the others have only non-negative integer powers.

Ans: (D) $-7x^{\frac{1}{2}}y$

2. The degree of $3x^2y - 9x^6 + 8x^2 + 5$ is

Degrees of the terms: 3, 6, 2, 0

The greatest is 6.

Ans: (D) 6

3. When $p(x) = 6 - 9x^2 + 7x^4 - 5x^3$ is written in standard form $a_nx^n + \dots + a_1x + a_0$, the value of a_n is

Standard form: $7x^4 - 5x^3 - 9x^2 + 6$

$n = 4$ and a_n is the coefficient of x^4 : $a_n = 7$

Ans: (C) 7

4. Which of the following is a cubic polynomial?

$-4 + 5x^3 - 3x$ has highest power 3, so it is a cubic polynomial.

Ans: (B) $-4 + 5x^3 - 3x$

5. Which of the following is not a polynomial?

In $-4x^3 - 5 + 2x^{-2}$, the power -2 of x is negative.

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

Ans: (C) $-4x^3 - 5 + 2x^{-2}$

6. If $(a + 5)x^2 + (b - 2a)x + (c + 3b)$ is a zero polynomial, then

$$a + 5 = 0 \Rightarrow a = -5$$

$$b - 2a = 0 \Rightarrow b + 10 = 0 \Rightarrow b = -10$$

$$c + 3b = 0 \Rightarrow c - 30 = 0 \Rightarrow c = 30$$

Ans: (D) $a = -5, b = -10, c = 30$

7. Which of the following is a quadratic equation?

$6x^2 - 6x - 4 = 0$: 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: (A) $6x^2 - 6x - 4 = 0$

8. If $p(x) = -3x^3 - 2x^2 - 6x + 4$, then $p(-3) =$

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

$$= 81 - 18 + 18 + 4$$

$$= 85$$

Ans: (A) 85

9. If 4 is a zero of $p(x) = x^2 - ax + 4$, then $a =$

$$p(4) = (4)^2 - a(4) + 4$$

$$= 16 - 4a + 4$$

$$= -4a + 20$$

$$-4a + 20 = 0 \Rightarrow a = 5$$

Ans: (B) 5

10. The roots of $8x^2 - 30x + 25 = 0$ are

$$8x^2 - 30x + 25 = 8x^2 - 10x - 20x + 25$$

$$= 2x(4x - 5) - 5(4x - 5)$$

$$= (4x - 5)(2x - 5)$$

$$\Rightarrow x = \frac{5}{4}, \frac{5}{2}$$

Ans: (D) $\frac{5}{4}, \frac{5}{2}$

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

$$a = 2, b = -10, c = -3$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{10 \pm \sqrt{100 - 4(2)(-3)}}{2(2)}$$

$$= \frac{5 + \sqrt{31}}{2}, \frac{5 - \sqrt{31}}{2}$$

Ans: (C) $\frac{5 \pm \sqrt{31}}{2}$

12. A polynomial of degree 8 is divided by a polynomial of degree 3. The degree of the quotient is

$$f(x) = g(x)q(x) + r(x): \text{degree of } q(x) = \text{degree of } f(x) - \text{degree of } g(x)$$

$$= 8 - 3 = 5$$

Ans: (B) 5

13. The remainder when $24x^3 - 4x^2 - 8x + 3$ is divided by $2x + 3$ is

$$2x + 3 = 0 \Rightarrow x = -\frac{3}{2}; \text{ remainder} = f\left(-\frac{3}{2}\right)$$

$$= -75$$

Ans: (C) -75

14. If $x - 1$ is a factor of $x^3 - 6x^2 + ax + 2$, then $a =$

$$f(1) = (1)^3 - 6(1)^2 + a(1) + 2$$

$$= 1 - 6 + a + 2$$

$$= a - 3$$

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

Ans: (A) 3

15. If $24x^4 - ax^3 - x^2 - x - 2$ is divisible by $2x + 1$, then $a =$

$$\begin{aligned} 2x + 1 = 0 &\Rightarrow x = -\frac{1}{2}; f\left(-\frac{1}{2}\right) = 0 \\ f\left(-\frac{1}{2}\right) &= 24\left(-\frac{1}{2}\right)^4 - a\left(-\frac{1}{2}\right)^3 - \left(-\frac{1}{2}\right)^2 - \left(-\frac{1}{2}\right) - 2 \\ &= \frac{3}{2} + \frac{1}{8}a - \frac{1}{4} + \frac{1}{2} - 2 \\ &= \frac{1}{8}a - \frac{1}{4} \\ \frac{1}{8}a - \frac{1}{4} &= 0 \Rightarrow a = 2 \end{aligned}$$

Ans: (D) 2

16. $7\sqrt{3}x^2 - 29x - 10\sqrt{3} =$

$$\begin{aligned} 7\sqrt{3}x^2 - 29x - 10\sqrt{3} &= 7\sqrt{3}x^2 + 6x - 35x - 10\sqrt{3} \\ &= \sqrt{3}x(7x + 2\sqrt{3}) - 5(7x + 2\sqrt{3}) = (\sqrt{3}x - 5)(7x + 2\sqrt{3}) \end{aligned}$$

Ans: (D) $(\sqrt{3}x - 5)(7x + 2\sqrt{3})$

17. What must be added to $-4x^3 + x^2 - 9x + 9$ so that it is exactly divisible by $x^2 + 2$?

$$\begin{aligned} -4x^3 \div x^2 &= -4x; (-4x) \times (x^2 + 2) = -4x^3 - 8x; \text{ subtract: } x^2 - x + 9 \\ x^2 \div x^2 &= 1; 1 \times (x^2 + 2) = x^2 + 2; \text{ subtract: } -x + 7 \\ \text{Remainder} &= -x + 7, \text{ so } x - 7 \text{ must be added.} \end{aligned}$$

Ans: (A) $x - 7$

18. If $x - 2$ and $x + 4$ are factors of $x^3 + ax^2 + bx - 24$, then

$$\begin{aligned} f(2) &= 0 \Rightarrow 2a + b = 8 \dots (1) \\ f(-4) &= 0 \Rightarrow 4a - b = 22 \dots (2) \\ (1) + (2): &6a = 30 \\ \Rightarrow a &= 5 \\ \text{Put } a = 5 \text{ in (1): } &10 + b = 8 \Rightarrow b = -2 \end{aligned}$$

Ans: (B) $a = 5, b = -2$

19. $x^2 - 6x + 3 =$

$$\begin{aligned} x &= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{6 \pm \sqrt{36 - 4(1)(3)}}{2(1)} \\ &= \frac{6 \pm \sqrt{24}}{2} \\ &= \frac{6 \pm 2\sqrt{6}}{2} \\ &= 3 \pm \sqrt{6} \\ &= 3 + \sqrt{6}, 3 - \sqrt{6} \\ \text{So } x^2 - 6x + 3 &= (x - \alpha)(x - \beta) = (x - 3 - \sqrt{6})(x - 3 + \sqrt{6}) \end{aligned}$$

Ans: (B) $(x - 3 - \sqrt{6})(x - 3 + \sqrt{6})$

20. Given that $x - 4$ is a factor, $x^3 - 10x^2 + 29x - 20 =$

$$\begin{aligned} x^3 \div x &= x^2; x^2 \times (x - 4) = x^3 - 4x^2; \text{ subtract: } -6x^2 + 29x - 20 \\ -6x^2 \div x &= -6x; (-6x) \times (x - 4) = -6x^2 + 24x; \text{ subtract: } 5x - 20 \\ 5x \div x &= 5; 5 \times (x - 4) = 5x - 20; \text{ subtract: } 0 \\ \text{Quotient} &= x^2 - 6x + 5 \end{aligned}$$

Ans: (A) $(x - 4)(x^2 - 6x + 5)$

21. $x^3 - 19x - 30 =$

$$f(-2) = -8 + 38 - 30 = 0$$

Dividing and splitting the quotient gives $f(x) = (x - 5)(x + 2)(x + 3)$.

Ans: (A) $(x - 5)(x + 2)(x + 3)$

22. Using synthetic division, the remainder when $x^3 + 6x + 5$ is divided by $x - 1$ is

Second row: 0 1 1 7

Bottom row: 1 1 7 | 12

Remainder = 12

Ans: (C) 12

23. $31^{155} + 12^{155}$ is exactly divisible by

$n = 155$: $x + a$ is a factor of $x^n + a^n$ (n odd).

So $31 + 12 = 43$ divides it.

Ans: (C) 43

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

$$a^3 \div 2a = \frac{1}{2}a^2; \frac{1}{2}a^2 \times (2a + x) = a^3 + \frac{1}{2}a^2x; \text{ subtract: } -2a^2x + 7ax^2 + 4x^3$$

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

$$8ax^2 \div 2a = 4x^2; 4x^2 \times (2a + x) = 8ax^2 + 4x^3; \text{ subtract: } 0$$

Ans: (A) $\frac{1}{2}a^2 - ax + 4x^2$

25. The quadratic polynomial which leaves the remainders 12, 0 and -12 when divided by $x + 1$, $x - 1$ and $x - 2$ respectively is

Check each remainder with the remainder theorem: $f(-1) = 12$, $f(1) = 0$, $f(2) = -12$.

Only $-2x^2 - 6x + 8$ gives all three.

Ans: (B) $-2x^2 - 6x + 8$
