EXPRESSWALA ACADEMY

Polynomials

MCQ Test, Set 08

Time: 30 minutes | Maximum marks: 25

Name: _____ Class: _____ Date: _____

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

1. Pick the expression that is not a monomial.

A. $9x^2y^4$ **B.** $-2x^5y^4$ **C.** $4x^{\frac{2}{3}}y^3$ **D.** $7x^4y^3$

2. The degree of $9xy^5 + 7x^2y^6 + 3x^3y + x^2y - 6$ is

A. 9 **B.** 5 **C.** 8 **D.** 6

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

A. 5 **B.** -3 **C.** 4 **D.** 3

4. Which of the following is an linear polynomial?

A. $8 - 3x$ **B.** $5 + 2x + 3x^2$ **C.** $6x^2 - 9 + 3x - 9x^4$ **D.** $8x^2 - 7x - 5x^3 - 8$

5. Which one of these is not a polynomial?

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

C. $\frac{1}{4}x^5 + 7x^4$ **D.** $-4x + 3x^2$

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

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

7. Among the following, the quadratic equation is

A. $x^2 - 2\sqrt{x} + 6 = 0$ **B.** $4x^2 - 2 = 0$ **C.** $4x - 1 = 0$ **D.** $x^2 + \frac{1}{x^2} = 6$

8. If $p(x) = 8x^2 - 7x + 3$, then $p(-2) =$

A. 21 **B.** 49 **C.** 43 **D.** -15

9. The zero of the polynomial $-9x + 6$ is

A. $-\frac{2}{3}$ **B.** $\frac{3}{2}$ **C.** $-\frac{3}{2}$ **D.** $\frac{2}{3}$

10. The roots of $x^2 + x - 56 = 0$ are

A. $8, -7$ **B.** $8, 7$ **C.** $-8, 7$ **D.** $-8, -7$

11. The discriminant of $2x^2 + x - 12 = 0$ is

A. -95 **B.** 97 **C.** 95 **D.** 25

12. A polynomial of degree 9 is divided by a polynomial of degree 2. The degree of the quotient is

A. 2 **B.** 18 **C.** 7 **D.** 11

13. If $x^3 - 4x^2 + ax - 7$ leaves the remainder -6 when divided by $x - 1$, then $a =$

A. 4 **B.** 10 **C.** 16 **D.** -6

14. If $8x^3 - 4x^2 + ax + 3$ is divisible by $2x - 1$, then $a =$

A. -7 **B.** -6 **C.** 6 **D.** 2

15. $2\sqrt{5}x^2 - 7x - 12\sqrt{5} =$

A. $(\sqrt{5}x - 4)(2x - 3\sqrt{5})$ **B.** $(\sqrt{5}x - 4)(2x + 3\sqrt{5})$
C. $(\sqrt{5}x + 4)(2x + 3\sqrt{5})$ **D.** $(\sqrt{5}x + 4)(2x - 3\sqrt{5})$

16. What must be subtracted from $-3x^3 - 3x^2 + x + 3$ so that it is exactly divisible by $x^2 + x - 2$?

A. $5x - 3$ **B.** $-5x - 3$ **C.** $-3x$ **D.** $-5x + 3$

17. What must be subtracted from $x^3 - 5x^2 + 4x + 9$ so that it is exactly divisible by $x - 2$?

A. -27 **B.** -5 **C.** 5 **D.** 27

18. If $x - 4$ and $x + 1$ are factors of $x^3 + ax^2 + bx - 16$, then

A. $a = -1, b = -16$ **B.** $a = 1, b = 16$ **C.** $a = -1, b = 16$ **D.** $a = 1, b = -16$

19. $x^2 - 2x - 4 =$

A. $(x + 1 - \sqrt{5})(x + 1 + \sqrt{5})$ **B.** $(x - 1 - \sqrt{5})(x - 1 + \sqrt{5})$
C. $(x - 2 - \sqrt{5})(x - 2 + \sqrt{5})$ **D.** $(x - 1 - 2\sqrt{5})(x - 1 + 2\sqrt{5})$

20. Given that $x + 4$ is a factor, $x^3 + 9x^2 + 14x - 24 =$

A. $(x + 4)(x^2 + 5x - 6)$ **B.** $(x + 4)(x^2 + 5x + 6)$
C. $(x + 4)(x^2 + 13x + 66)$ **D.** $(x + 4)(x^2 - 5x - 6)$

21. $x^3 + 6x^2 + 11x + 6 =$

A. $(x + 3)(x + 2)(x + 1)$ **B.** $(x - 3)(x + 2)(x + 1)$ **C.** $(x + 3)(x - 2)(x + 1)$ **D.** $(x - 3)(x - 2)(x - 1)$

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

A. 5 **B.** 8 **C.** 9 **D.** -9

23. $29^{155} + 3^{155}$ is exactly divisible by

A. 26 **B.** 32 **C.** 3 **D.** 29

24. When $\frac{27}{8}a^3 - \frac{27}{16}a^2x + \frac{9}{32}ax^2 - \frac{1}{64}x^3$ is divided by $\frac{3}{2}a - \frac{1}{4}x$, the quotient is

A. $\frac{9}{4}a^2 - \frac{3}{4}ax + \frac{1}{16}x^2$ **B.** $\frac{9}{4}a^2 + \frac{3}{4}ax + \frac{1}{16}x^2$
C. $\frac{9}{4}a^2 - \frac{3}{4}ax - \frac{1}{16}x^2$ **D.** $\frac{9}{4}a^2 + \frac{1}{16}x^2$

25. The quadratic polynomial which leaves the remainders 0, -5 and -32 when divided by $x+1$, x and $x-3$ respectively is

A. x^2-6x-5 **B.** $-x^2+6x-5$ **C.** $-x^2-6x+5$ **D.** $-x^2-6x-5$

Key sheet

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

Solutions

1. Pick the expression that is not a monomial.

The power $\frac{2}{3}$ of x is not a whole number.

So $4x^{\frac{2}{3}}y^3$ is not a monomial; the others have only non-negative integer powers.

Ans: (C) $4x^{\frac{2}{3}}y^3$

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2. The degree of $9xy^5 + 7x^2y^6 + 3x^3y + x^2y - 6$ is

Degrees of the terms: $6, 8, 4, 3, 0$

The greatest is 8.

Ans: (C) 8

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

Standard form: $3x^5 + 5x + 4$

$n = 5$ and a_n is the coefficient of x^5: $a_n = 3$

Ans: (D) 3

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4. Which of the following is an linear polynomial?

$8 - 3x$ has highest power 1, so it is an linear polynomial.

Ans: (A) $8 - 3x$

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5. Which one of these is not a polynomial?

In $4 + 2x^{\frac{1}{3}}$, the power $\frac{1}{3}$ of x is not a whole number.

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

Ans: (A) $4 + 2x^{\frac{1}{3}}$

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

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

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

$r + q = 0 \Rightarrow r - 5 = 0 \Rightarrow r = 5$

Ans: (C) $p = 5, q = -5, r = 5$

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7. Among the following, the quadratic equation is

$4x^2 - 2 = 0$: 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: (B) $4x^2 - 2 = 0$

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8. If $p(x) = 8x^2 - 7x + 3$, then $p(-2) =$

$p(-2) = 8(-2)^2 - 7(-2) + 3$

$= 32 + 14 + 3$

$= 49$

Ans: (B) 49

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9. The zero of the polynomial $-9x + 6$ is

$-9x + 6 = 0 \Rightarrow -9x = -6 \Rightarrow x = \frac{2}{3}$

Ans: (D) $\frac{2}{3}$

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10. The roots of $x^2 + x - 56 = 0$ are

$x^2 + x - 56 = x^2 - 7x + 8x - 56$

$= x(x - 7) + 8(x - 7)$

$= (x - 7)(x + 8)$

$\Rightarrow x = -8, 7$

Ans: (C) $-8, 7$

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11. The discriminant of $2x^2 + x - 12 = 0$ is

$\Delta = b^2 - 4ac = 1^2 - 4(2)(-12) = 97$

Ans: (B) 97

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12. A polynomial of degree 9 is divided by a polynomial of degree 2. The degree of the quotient is

$f(x) = g(x)q(x) + r(x)$: degree of $q(x)$ = degree of $f(x)$ − degree of $g(x)$

$= 9 - 2 = 7$

Ans: (C) 7

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13. If $x^3 - 4x^2 + ax - 7$ leaves the remainder -6 when divided by $x - 1$, then $a =$

$f(1) = (1)^3 - 4(1)^2 + a(1) - 7$

$= 1 - 4 + a - 7$

$= a - 10$

$a - 10 = -6 \Rightarrow a = 4$

Ans: (A) 4

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14. If $8x^3 - 4x^2 + ax + 3$ is divisible by $2x - 1$, then $a =$

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

$f\left(\frac{1}{2}\right) = 8\left(\frac{1}{2}\right)^3 - 4\left(\frac{1}{2}\right)^2 + a\left(\frac{1}{2}\right) + 3$

$= 1 - 1 + \frac{1}{2}a + 3$

$= \frac{1}{2}a + 3$

$\frac{1}{2}a + 3 = 0 \Rightarrow a = -6$

Ans: (B) -6

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15. $2\sqrt{5}x^2 - 7x - 12\sqrt{5} =$

$2\sqrt{5}x^2 - 7x - 12\sqrt{5} = 2\sqrt{5}x^2 - 15x + 8x - 12\sqrt{5}$

$= \sqrt{5}x(2x - 3\sqrt{5}) + 4(2x - 3\sqrt{5}) = (\sqrt{5}x + 4)(2x - 3\sqrt{5})$

Ans: (D) $(\sqrt{5}x + 4)(2x - 3\sqrt{5})$

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16. What must be subtracted from $-3x^3 - 3x^2 + x + 3$ so that it is exactly divisible by $x^2 + x - 2$?

$-3x^3 \div x^2 = -3x$; $(-3x) \times (x^2 + x - 2) = -3x^3 - 3x^2 + 6x$; subtract: $-5x + 3$

Remainder $= -5x + 3$, so $-5x + 3$ must be subtracted.

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

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17. What must be subtracted from $x^3 - 5x^2 + 4x + 9$ so that it is exactly divisible by $x - 2$?

Remainder $= f(2)$ (remainder theorem)

$f(2) = (2)^3 - 5(2)^2 + 4(2) + 9$

$= 8 - 20 + 8 + 9$

$= 5$

The remainder is 5, so 5 must be subtracted.

Ans: (C) 5

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18. If $x - 4$ and $x + 1$ are factors of $x^3 + ax^2 + bx - 16$, then

$f(4) = 0 \Rightarrow 4a + b = -12$ ... (1)

$f(-1) = 0 \Rightarrow a - b = 17$ ... (2)

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

$\Rightarrow a = 1$

Put $a = 1$ in (1): $4 + b = -12 \Rightarrow b = -16$

Ans: (D) $a = 1, b = -16$

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19. $x^2 - 2x - 4 =$

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

$= \frac{2 \pm \sqrt{20}}{2}$

$= \frac{2 \pm 2\sqrt{5}}{2}$

$= 1 \pm \sqrt{5}$

$= 1 + \sqrt{5}, 1 - \sqrt{5}$

So $x^2 - 2x - 4 = (x - \alpha)(x - \beta) = (x - 1 - \sqrt{5})(x - 1 + \sqrt{5})$

Ans: (B) $(x - 1 - \sqrt{5})(x - 1 + \sqrt{5})$

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20. Given that $x + 4$ is a factor, $x^3 + 9x^2 + 14x - 24 =$

$x^3 \div x = x^2$; $x^2 \times (x + 4) = x^3 + 4x^2$; subtract: $5x^2 + 14x - 24$

$5x^2 \div x = 5x$; $5x \times (x + 4) = 5x^2 + 20x$; subtract: $-6x - 24$

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

Quotient $= x^2 + 5x - 6$

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

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21. $x^3 + 6x^2 + 11x + 6 =$

$f(-1) = -1 + 6 - 11 + 6 = 0$

Dividing and splitting the quotient gives $f(x) = (x + 3)(x + 2)(x + 1)$.

Ans: (A) $(x + 3)(x + 2)(x + 1)$

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

Second row: $0 \quad 2 \quad 8 \quad 8$

Bottom row: $2 \quad 8 \quad 8 \mid 9$

Remainder $= 9$

Ans: (C) 9

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23. $29^{155} + 3^{155}$ is exactly divisible by

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

So $29 + 3 = 32$ divides it.

Ans: (B) 32

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24. When $\frac{27}{8}a^3 - \frac{27}{16}a^2x + \frac{9}{32}ax^2 - \frac{1}{64}x^3$ is divided by $\frac{3}{2}a - \frac{1}{4}x$, the quotient is

$\frac{27}{8}a^3 \div \frac{3}{2}a = \frac{9}{4}a^2$; $\frac{9}{4}a^2 \times (\frac{3}{2}a - \frac{1}{4}x) = \frac{27}{8}a^3 - \frac{9}{16}a^2x$; subtract: $-\frac{9}{8}a^2x + \frac{9}{32}ax^2 - \frac{1}{64}x^3$

$-\frac{9}{8}a^2x \div \frac{3}{2}a = -\frac{3}{4}ax$; $(-\frac{3}{4}ax) \times (\frac{3}{2}a - \frac{1}{4}x) = -\frac{9}{8}a^2x + \frac{3}{16}ax^2$; subtract: $\frac{3}{32}ax^2 - \frac{1}{64}x^3$

$\frac{3}{32}ax^2 \div \frac{3}{2}a = \frac{1}{16}x^2$; $\frac{1}{16}x^2 \times (\frac{3}{2}a - \frac{1}{4}x) = \frac{3}{32}ax^2 - \frac{1}{64}x^3$; subtract: 0

Ans: (A) $\frac{9}{4}a^2 - \frac{3}{4}ax + \frac{1}{16}x^2$

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25. The quadratic polynomial which leaves the remainders 0, -5 and -32 when divided by $x + 1$, x and $x - 3$ respectively is

Check each remainder with the remainder theorem: $f(-1) = 0$, $f(0) = -5$, $f(3) = -32$.

Only $-x^2 - 6x - 5$ gives all three.

Ans: (D) $-x^2 - 6x - 5$