EXPRESSWALA ACADEMY

Polynomials

MCQ Test, Set 04

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. Which one of these is a monomial?

A. $-6x^4y^2$ **B.** $\frac{5}{x^4}$ **C.** $\frac{7x}{y}$ **D.** $-2\sqrt{x}y^2$

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

A. 4 **B.** 3 **C.** 7 **D.** 5

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

A. 9 **B.** 1 **C.** -9 **D.** 4

4. Which of the following is a quadratic polynomial?

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

5. Among the following, the one that is not a polynomial is

A. $-4x^{-3} - 9x^2 + 2$ **B.** $-3\sqrt{5}x^4 - 6x^2 - 2\sqrt{5}x^3$

C. $4\sqrt{5}x^4 + 4\sqrt{3}x + 8x^3$ **D.** $2x^4 + \frac{7}{4}x^2$

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

A. $p = -5, q = 10, r = -20$ **B.** $p = -5, q = -10, r = 20$ **C.** $p = -5, q = 10, r = 20$ **D.** $p = 5, q = -10, r = 20$

7. Pick the quadratic equation.

A. $-6x - 1 = 0$ **B.** $x^2 - 4\sqrt{x} + 7 = 0$

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

8. If $p(x) = x^3 + 5x^2 + 7x - 8$, then $p(-1) =$

A. -11 **B.** 5 **C.** 3 **D.** -21

9. If 1 is a zero of $p(x) = x^3 + 3x^2 - ax - 5$, then $a =$

A. 3 **B.** 1 **C.** 0 **D.** -1

10. The roots of $5x^2 + 19x + 12 = 0$ are

A. $-3, -\frac{4}{5}$ **B.** $-3, -4$

C. $-\frac{1}{3}, -\frac{5}{4}$ **D.** $3, \frac{4}{5}$

11. The roots of $x^2 - 10x + 9 = 0$ are

A. $1, -9$ **B.** $-1, 9$ **C.** $1, 9$ **D.** $-1, -9$

12. The roots of $x^2 - 10x - 5 = 0$ are

A. $-5 \pm \sqrt{30}$ **B.** $5 \pm \sqrt{30}$ **C.** $10 \pm 2\sqrt{30}$ **D.** $5 \pm 2\sqrt{5}$

13. The remainder when $x^4 + 4x^3 + x^2 - 10x - 8$ is divided by $x^2 - x - 1$ is

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

14. The remainder when $16x^3 - 8x^2 + 4x + 5$ is divided by $2x + 3$ is

A. -511 **B.** 73 **C.** -73 **D.** 47

15. If $x + 2$ is a factor of $x^3 + 5x^2 + ax + 4$, then $a =$

A. 8 **B.** -16 **C.** 6 **D.** -8

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

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

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

17. What must be subtracted from $-3x^3 + 6x^2 + 8x - 1$ so that it is exactly divisible by $x^2 - 1$?

A. $-3x + 6$ **B.** $5x + 5$ **C.** $5x - 5$ **D.** $-5x - 5$

18. If $x - 4$ and $x + 2$ are factors of $x^3 + ax^2 + bx + 8$, then

A. $a = 3, b = 6$ **B.** $a = 3, b = -6$ **C.** $a = -3, b = 6$ **D.** $a = -3, b = -6$

19. $x^2 + 4x - 7 =$

A. $(x + 2 - \sqrt{11})(x + 2 + \sqrt{11})$ **B.** $(x - 2 - \sqrt{11})(x - 2 + \sqrt{11})$

C. $(x + 2 - 2\sqrt{11})(x + 2 + 2\sqrt{11})$ **D.** $(x + 4 - \sqrt{11})(x + 4 + \sqrt{11})$

20. Given that $x + 5$ is a factor, $x^3 - 19x + 30 =$

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

21. $x^3 - 3x^2 - 10x + 24 =$

A. $(x - 4)(x - 3)(x - 2)$ **B.** $(x - 4)(x + 3)(x - 2)$ **C.** $(x + 4)(x - 3)(x + 2)$ **D.** $(x + 4)(x + 3)(x - 2)$

22. Using synthetic division, the remainder when $x^3 + 3x^2 + 5$ is divided by $x - 1$ is

A. 4 **B.** 9 **C.** 7 **D.** -9

23. $x^4 - 81 = (x - 3)\times$

A. $x^3 + 3x^2 + 3x + 3$ **B.** $x^3 + 3x^2 + 6x + 9$ **C.** $x^3 - 3x^2 + 9x - 27$ **D.** $x^3 + 3x^2 + 9x + 27$

24. When $8a^3 + 6a^2x + \frac{3}{2}ax^2 + \frac{1}{8}x^3$ is divided by $2a + \frac{1}{2}x$, the quotient is

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

C. $4a^2 + 2ax + \frac{1}{4}x^2$ **D.** $4a^2 + \frac{1}{4}x^2$

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25. The quadratic polynomial which leaves the remainders -7, -10 and -11 when divided by $x - 1$, $x - 2$ and $x - 3$ respectively is

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

Key sheet

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

Solutions

1. Which one of these is a monomial?

$-6x^4y^2$: the powers of x and y are 4 and 2, non-negative integers, so it is a monomial.

Each of the others has a negative or fractional power.

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

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

Degrees of the terms: $3, 7, 2, 0$

The greatest is 7.

Ans: (C) 7

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

Standard form: $x^4 + 9x - 9$

$n = 4$ and a_n is the coefficient of x^4: $a_n = 1$

Ans: (B) 1

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4. Which of the following is a quadratic polynomial?

$x - 8x^2 + 7$ has highest power 2, so it is a quadratic polynomial.

Ans: (D) $x - 8x^2 + 7$

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5. Among the following, the one that is not a polynomial is

In $-4x^{-3} - 9x^2 + 2$, 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) $-4x^{-3} - 9x^2 + 2$

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

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

$q + 2p = 0 \Rightarrow q - 10 = 0 \Rightarrow q = 10$

$r + 2q = 0 \Rightarrow r + 20 = 0 \Rightarrow r = -20$

Ans: (A) $p = -5, q = 10, r = -20$

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7. Pick the quadratic equation.

$5\sqrt{2}x^2 - x + 4\sqrt{2} = 0$: 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: (C) $5\sqrt{2}x^2 - x + 4\sqrt{2} = 0$

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8. If $p(x) = x^3 + 5x^2 + 7x - 8$, then $p(-1) =$

$p(-1) = (-1)^3 + 5(-1)^2 + 7(-1) - 8$

$= -1 + 5 - 7 - 8$

$= -11$

Ans: (A) -11

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9. If 1 is a zero of $p(x) = x^3 + 3x^2 - ax - 5$, then $a =$

$p(1) = (1)^3 + 3(1)^2 - a(1) - 5$

$= 1 + 3 - a - 5$

$= -a - 1$

$-a - 1 = 0 \Rightarrow a = -1$

Ans: (D) -1

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10. The roots of $5x^2 + 19x + 12 = 0$ are

$5x^2 + 19x + 12 = 5x^2 + 4x + 15x + 12$

$= x(5x + 4) + 3(5x + 4)$

$= (5x + 4)(x + 3)$

$\Rightarrow x = -3, -\frac{4}{5}$

Ans: (A) $-3, -\frac{4}{5}$

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11. The roots of $x^2 - 10x + 9 = 0$ are

$x^2 - 10x + 9 = x^2 - x - 9x + 9$

$= x(x - 1) - 9(x - 1)$

$= (x - 1)(x - 9)$

$\Rightarrow x = 1, 9$

Ans: (C) $1, 9$

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12. The roots of $x^2 - 10x - 5 = 0$ are

$a = 1, b = -10, c = -5$

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a} = \frac{10 \pm \sqrt{100 - 4(1)(-5)}}{2(1)}$

$= 5 + \sqrt{30}, 5 - \sqrt{30}$

Ans: (B) $5 \pm \sqrt{30}$

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13. The remainder when $x^4 + 4x^3 + x^2 - 10x - 8$ is divided by $x^2 - x - 1$ is

$x^4 \div x^2 = x^2$; $x^2 \times (x^2 - x - 1) = x^4 - x^3 - x^2$; subtract: $5x^3 + 2x^2 - 10x - 8$

$5x^3 \div x^2 = 5x$; $5x \times (x^2 - x - 1) = 5x^3 - 5x^2 - 5x$; subtract: $7x^2 - 5x - 8$

$7x^2 \div x^2 = 7$; $7 \times (x^2 - x - 1) = 7x^2 - 7x - 7$; subtract: $2x - 1$

Remainder $= 2x - 1$

Ans: (D) $2x - 1$

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14. The remainder when $16x^3 - 8x^2 + 4x + 5$ is divided by $2x + 3$ is

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

$= -73$

Ans: (C) -73

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15. If $x+2$ is a factor of x^3+5x^2+ax+4, then $a=$

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

$=-8+20-2a+4$

$=-2a+16$

$-2a+16=0 \Rightarrow a=8$

Ans: (A) 8

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

$3\sqrt{2}x^2+7x-3\sqrt{2}=3\sqrt{2}x^2-2x+9x-3\sqrt{2}$

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

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

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17. What must be subtracted from $-3x^3+6x^2+8x-1$ so that it is exactly divisible by x^2-1?

$-3x^3 \div x^2=-3x$; $(-3x)\times(x^2-1)=-3x^3+3x$; subtract: $6x^2+5x-1$

$6x^2 \div x^2=6$; $6\times(x^2-1)=6x^2-6$; subtract: $5x+5$

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

Ans: (B) $5x+5$

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18. If $x-4$ and $x+2$ are factors of x^3+ax^2+bx+8, then

$f(4)=0 \Rightarrow 4a+b=-18$ ... (1)

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

$(1)+(2)$: $6a=-18$

$\Rightarrow a=-3$

Put $a=-3$ in (1): $-12+b=-18 \Rightarrow b=-6$

Ans: (D) $a=-3, b=-6$

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19. $x^2+4x-7=$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}=\frac{-4\pm\sqrt{16-4(1)(-7)}}{2(1)}$

$=\frac{-4\pm\sqrt{44}}{2}$

$=\frac{-4\pm2\sqrt{11}}{2}$

$=-2\pm\sqrt{11}$

$=-2+\sqrt{11}, -2-\sqrt{11}$

So $x^2+4x-7=(x-\alpha)(x-\beta)=(x+2-\sqrt{11})(x+2+\sqrt{11})$

Ans: (A) $(x+2-\sqrt{11})(x+2+\sqrt{11})$

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20. Given that $x+5$ is a factor, $x^3-19x+30=$

$x^3 \div x=x^2$; $x^2\times(x+5)=x^3+5x^2$; subtract: $-5x^2-19x+30$

$-5x^2 \div x=-5x$; $(-5x)\times(x+5)=-5x^2-25x$; subtract: $6x+30$

$6x \div x=6$; $6\times(x+5)=6x+30$; subtract: 0

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

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

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21. $x^3 - 3x^2 - 10x + 24 =$

$f(2) = 8 - 12 - 20 + 24 = 0$

Dividing and splitting the quotient gives $f(x) = (x-4)(x+3)(x-2)$.

Ans: (B) $(x-4)(x+3)(x-2)$

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22. Using synthetic division, the remainder when $x^3 + 3x^2 + 5$ is divided by $x - 1$ is

Second row: $0 \quad 1 \quad 4 \quad 4$

Bottom row: $1 \quad 4 \quad 4 \mid 9$

Remainder $= 9$

Ans: (B) 9

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23. $x^4 - 81 = (x-3)\times$

$x^4 - 81 = (x-3)(x^3 + 3x^2 + 9x + 27)$

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

Ans: (D) $x^3 + 3x^2 + 9x + 27$

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24. When $8a^3 + 6a^2x + \frac{3}{2}ax^2 + \frac{1}{8}x^3$ is divided by $2a + \frac{1}{2}x$, the quotient is

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

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

$\frac{1}{2}ax^2 \div 2a = \frac{1}{4}x^2$; $\frac{1}{4}x^2 \times (2a + \frac{1}{2}x) = \frac{1}{2}ax^2 + \frac{1}{8}x^3$; subtract: 0

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

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25. The quadratic polynomial which leaves the remainders -7, -10 and -11 when divided by $x - 1$, $x - 2$ and $x - 3$ respectively is

Check each remainder with the remainder theorem: $f(1) = -7$, $f(2) = -10$, $f(3) = -11$.

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

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