EXPRESSWALA ACADEMY

Maths 1A: Determinants

MCQ Test, Set 02

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. The value of $\begin{vmatrix} 3 & 5 \\ 7 & -1 \end{vmatrix}$ is

A. -38 **B.** 26 **C.** 38 **D.** 32

2. If $\begin{vmatrix} x & -5 \\ 1 & x \end{vmatrix} = 21$, then

A. $x = 4$ only **B.** $x = \pm\sqrt{26}$ **C.** $x = \pm 5$ **D.** $x = \pm 4$

3. The cofactor of the element -2 in $\begin{bmatrix} 0 & 4 & 6 \\ -3 & 6 & -1 \\ 5 & -2 & -3 \end{bmatrix}$ is

A. -20 **B.** -18 **C.** -17 **D.** 18

4. In $\begin{bmatrix} 4 & 5 & 1 \\ -2 & -3 & -5 \\ 0 & 8 & -3 \end{bmatrix}$, the minor M_{32} is

A. 18 **B.** 32 **C.** -18 **D.** -22

5. $\begin{vmatrix} 5 & 1 & -4 \\ 3 & -2 & 4 \\ -3 & 0 & 5 \end{vmatrix} =$

A. 1 **B.** 53 **C.** -50 **D.** -53

6. The value of $\begin{vmatrix} 0 & 1 & 6 \\ 1 & -1 & 5 \\ 1 & 0 & 1 \end{vmatrix}$ is

A. 0 **B.** -10 **C.** 2 **D.** 10

7. If $\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix} = -7$, then $\begin{vmatrix} p & q & r \\ a & b & c \\ -3x & -3y & -3z \end{vmatrix} =$

A. -42 **B.** 21 **C.** -21 **D.** -7

8. If $\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix} = -5$, then $\begin{vmatrix} 2a & 2b & 2c \\ 2p & 2q & 2r \\ 2x & 2y & 2z \end{vmatrix} =$

A. -40 **B.** -5 **C.** -15 **D.** 40

9. Using $C_3 \to C_3 - 9C_2$, the value of $\begin{vmatrix} 3 & 4 & 37 \\ 0 & 3 & 25 \\ 7 & -1 & -7 \end{vmatrix}$ is

A. -55 **B.** -130 **C.** 65 **D.** -65

10. Using $C_2 \to C_2 - 10C_3$, the value of $\begin{vmatrix} 6 & 58 & 6 \\ 0 & -33 & -3 \\ 7 & 65 & 6 \end{vmatrix}$ is

A. 300 **B.** 150 **C.** -150 **D.** 160

11. For $A = \begin{bmatrix} 7 & 2 & 7 \\ 4 & 5 & -4 \\ -4 & 0 & 5 \end{bmatrix}$ with cofactors A_{ij}, $a_{11}A_{21} + a_{12}A_{22} + a_{13}A_{23} =$

A. 614 **B.** 0 **C.** -307 **D.** 307

12. The roots of $\begin{vmatrix} x & 6 & 6 \\ 6 & x & 6 \\ 6 & 6 & x \end{vmatrix} = 0$ are

A. $6,\ -18$ **B.** $-6,\ 12$ **C.** $6,\ 12$ **D.** $6,\ -12$

13. A, B are of order 3 with $|A| = -3$, $|B| = -2$. Then $|2AB| =$

A. 48 **B.** 12 **C.** -48 **D.** 6

14. If A is of order 2 and $|A| = -4$, then $|-A^T| =$

A. 8 **B.** 16 **C.** -4 **D.** 4

15. $\begin{vmatrix} 0 & -4 & -1 \\ 4 & 0 & 6 \\ 1 & -6 & 0 \end{vmatrix} =$

A. -24 **B.** 0 **C.** 48 **D.** 53

16. The determinant of $\begin{bmatrix} 1 & 0 & 10 \\ 0 & -5 & -6 \\ 0 & 0 & 4 \end{bmatrix}$ is

A. 0 **B.** -15 **C.** -20 **D.** 20

17. $\begin{vmatrix} 10 & 6 & 1 \\ 9 & 7 & 1 \\ 9 & 6 & 2 \end{vmatrix} =$

A. 17 **B.** 54 **C.** 16 **D.** 55

18. $\begin{vmatrix} 1 & 6 & 36 \\ 1 & 2 & 4 \\ 1 & 8 & 64 \end{vmatrix} =$

A. 48 **B.** -768 **C.** -48 **D.** -336

19. $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} =$

A. $(x+y+z)(x-y)(y-z)(z-x)$ **B.** $(x-y)(y-z)(z-x)$

C. $(x+y)(y+z)(z+x)$ **D.** $(x-y)(y-z)(x-z)$

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20. $\begin{vmatrix} -1 & -4 \\ 2 & -3 \end{vmatrix} \times \begin{vmatrix} -4 & -3 \\ -4 & -4 \end{vmatrix} =$

A. 44 **B.** 21 **C.** -44 **D.** 15

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21. If $\Delta(x) = \begin{vmatrix} 3x-2 & \sin x \\ -1 & -1 \end{vmatrix}$, then $\Delta'(x) =$

A. 0 **B.** $2\cos x - 6$ **C.** $\cos x - 3$ **D.** $3 - \cos x$

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22. If $\Delta(x) = \begin{vmatrix} e^x & 2x+1 \\ 3x-2 & e^{2x} \end{vmatrix}$, then $\Delta'(x) =$

A. $-12x + 3e^{3x} + 1$ **B.** $12x - 3e^{3x} - 1$ **C.** $-6x + e^{3x} + 4$ **D.** $2e^{3x} - 6$

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23. $\int_0^1 \begin{vmatrix} e^x & 4x^3 \\ 2 & -4 \end{vmatrix} dx =$

A. $3 - 4e$ **B.** $-2 + 4e$ **C.** $2 - 4e$ **D.** $4 - 8e$

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24. $\begin{bmatrix} p & 3 \\ -3 & 3 \end{bmatrix}$ is singular when $p =$

A. 3 **B.** -6 **C.** -2 **D.** -3

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25. $\begin{bmatrix} -2 & -2 \\ 6 & p \end{bmatrix}$ is singular when $p =$

A. 12 **B.** 6 **C.** -6 **D.** 7

Key sheet

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

Solutions

1. The value of $\begin{vmatrix} 3 & 5 \\ 7 & -1 \end{vmatrix}$ is

$3 \cdot (-1) - 5 \cdot 7 = -38$

Ans: (A) -38

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2. If $\begin{vmatrix} x & -5 \\ 1 & x \end{vmatrix} = 21$, then

$x^2 - (-5) = 21$

$x^2 = 16 \Rightarrow x = \pm 4$

Ans: (D) $x = \pm 4$

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3. The cofactor of the element -2 in $\begin{bmatrix} 0 & 4 & 6 \\ -3 & 6 & -1 \\ 5 & -2 & -3 \end{bmatrix}$ is

$M_{32} = \begin{vmatrix} 0 & 6 \\ -3 & -1 \end{vmatrix} = 18$

$A_{32} = (-1)^5(18) = -18$

Ans: (B) -18

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4. In $\begin{bmatrix} 4 & 5 & 1 \\ -2 & -3 & -5 \\ 0 & 8 & -3 \end{bmatrix}$, the minor M_{32} is

$M_{32} = \begin{vmatrix} 4 & 1 \\ -2 & -5 \end{vmatrix} = -20 - (-2) = -18$

Ans: (C) -18

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5. $\begin{vmatrix} 5 & 1 & -4 \\ 3 & -2 & 4 \\ -3 & 0 & 5 \end{vmatrix} =$

$\Delta = -3\begin{vmatrix} 1 & -4 \\ -2 & 4 \end{vmatrix} + 5\begin{vmatrix} 5 & 1 \\ 3 & -2 \end{vmatrix}$

$= -3(4 - 8) + 5(-10 - 3)$

$= -3(-4) + 5(-13) = -53$

Ans: (D) -53

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6. The value of $\begin{vmatrix} 0 & 1 & 6 \\ 1 & -1 & 5 \\ 1 & 0 & 1 \end{vmatrix}$ is

$\Delta = -\begin{vmatrix} 1 & 5 \\ 1 & 1 \end{vmatrix} + 6\begin{vmatrix} 1 & -1 \\ 1 & 0 \end{vmatrix}$

$= -(1 - 5) + 6(0 - (-1))$

$= -(-4) + 6(1) = 10$

Ans: (D) 10

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7. If $\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix} = -7$, then $\begin{vmatrix} p & q & r \\ a & b & c \\ -3x & -3y & -3z \end{vmatrix} =$

Two rows are interchanged (sign changes) and one row is multiplied by -3.

$\therefore \text{value} = 3 \times (-7) = -21$

Ans: (C) -21

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8. If $\begin{vmatrix} a & b & c \\ p & q & r \\ x & y & z \end{vmatrix} = -5$, then $\begin{vmatrix} 2a & 2b & 2c \\ 2p & 2q & 2r \\ 2x & 2y & 2z \end{vmatrix} =$

Every element is multiplied by 2: each of the 3 rows gives a factor 2.

$\therefore \text{value} = 8 \times (-5) = -40$

Ans: (A) -40

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9. Using $C_3 \to C_3 - 9C_2$, the value of $\begin{vmatrix} 3 & 4 & 37 \\ 0 & 3 & 25 \\ 7 & -1 & -7 \end{vmatrix}$ is

$C_3 \to C_3 - 9C_2$ leaves the value unchanged and gives $\begin{vmatrix} 3 & 4 & 1 \\ 0 & 3 & -2 \\ 7 & -1 & 2 \end{vmatrix}$.

$\Delta = -65$

Ans: (D) -65

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10. Using $C_2 \to C_2 - 10C_3$, the value of $\begin{vmatrix} 6 & 58 & 6 \\ 0 & -33 & -3 \\ 7 & 65 & 6 \end{vmatrix}$ is

$C_2 \to C_2 - 10C_3$ leaves the value unchanged and gives $\begin{vmatrix} 6 & -2 & 6 \\ 0 & -3 & -3 \\ 7 & 5 & 6 \end{vmatrix}$.

$\Delta = 150$

Ans: (B) 150

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11. For $A = \begin{bmatrix} 7 & 2 & 7 \\ 4 & 5 & -4 \\ -4 & 0 & 5 \end{bmatrix}$ with cofactors A_{ij}, $a_{11}A_{21} + a_{12}A_{22} + a_{13}A_{23} =$

Elements of one line times the cofactors of a different line give 0.

$a_{11}A_{21} + a_{12}A_{22} + a_{13}A_{23} = 0$

Ans: (B) 0

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12. The roots of $\begin{vmatrix} x & 6 & 6 \\ 6 & x & 6 \\ 6 & 6 & x \end{vmatrix} = 0$ are

$\Delta = (x + 12)(x - 6)^2$

$x = 6 \text{ (twice)}$ or $x = -12$

Ans: (D) $6,\ -12$

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13. A, B are of order 3 with $|A| = -3$, $|B| = -2$. Then $|2AB| =$

$|2AB| = 2^3|A|\,|B| = 48$

Ans: (A) 48

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14. If A is of order 2 and $|A| = -4$, then $|-A^T| =$

$|-A^T| = (-1)^2|A^T| = (-1)^2|A| = -4$

Ans: (C) -4

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15. $\begin{vmatrix} 0 & -4 & -1 \\ 4 & 0 & 6 \\ 1 & -6 & 0 \end{vmatrix} =$

Skew-symmetric of odd order, so the determinant is 0.

Ans: (B) 0

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16. The determinant of $\begin{bmatrix} 1 & 0 & 10 \\ 0 & -5 & -6 \\ 0 & 0 & 4 \end{bmatrix}$ is

Triangular: product of the diagonal elements.

$1 \times (-5) \times 4 = -20$

Ans: (C) -20

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17. $\begin{vmatrix} 10 & 6 & 1 \\ 9 & 7 & 1 \\ 9 & 6 & 2 \end{vmatrix} =$

Result 8 with $a, b, c = 9, 6, 1$:

$1 + a + b + c = 17$

Ans: (A) 17

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18. $\begin{vmatrix} 1 & 6 & 36 \\ 1 & 2 & 4 \\ 1 & 8 & 64 \end{vmatrix} =$

Use result 3, $(a-b)(b-c)(c-a)$ with $a, b, c = 6, 2, 8$.

$(6-2)(2-8)(8-6) = -48$

Ans: (C) -48

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19. $\begin{vmatrix} 1 & x & x^2 \\ 1 & y & y^2 \\ 1 & z & z^2 \end{vmatrix} =$

Result 3 (Vandermonde) with $a, b, c = x, y, z$.

Ans: (B) $(x-y)(y-z)(z-x)$

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20. $\begin{vmatrix} -1 & -4 \\ 2 & -3 \end{vmatrix} \times \begin{vmatrix} -4 & -3 \\ -4 & -4 \end{vmatrix} =$

$11 \times 4 = 44$

This equals the determinant of the row by row product.

Ans: (A) 44

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21. If $\Delta(x) = \begin{vmatrix} 3x-2 & \sin x \\ -1 & -1 \end{vmatrix}$, then $\Delta'(x) =$

$\Delta'(x) = \begin{vmatrix} 3 & \cos x \\ -1 & -1 \end{vmatrix} + \begin{vmatrix} 3x-2 & \sin x \\ 0 & 0 \end{vmatrix}$

$= \cos x - 3$

Ans: (C) $\cos x - 3$

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22. If $\Delta(x) = \begin{vmatrix} e^x & 2x+1 \\ 3x-2 & e^{2x} \end{vmatrix}$, then $\Delta'(x) =$

$\Delta'(x) = \begin{vmatrix} e^x & 2 \\ 3x-2 & e^{2x} \end{vmatrix} + \begin{vmatrix} e^x & 2x+1 \\ 3 & 2e^{2x} \end{vmatrix}$

$= -12x + 3e^{3x} + 1$

Ans: (A) $-12x + 3e^{3x} + 1$

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23. $\int_0^1 \begin{vmatrix} e^x & 4x^3 \\ 2 & -4 \end{vmatrix} dx =$

Only one row contains x, so integrate that row:

$\begin{vmatrix} \int_0^1 e^x\,dx & \int_0^1 4x^3\,dx \\ 2 & -4 \end{vmatrix} = \begin{vmatrix} -1+e & 1 \\ 2 & -4 \end{vmatrix}$

$= 2 - 4e$

Ans: (C) $2 - 4e$

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24. $\begin{bmatrix} p & 3 \\ -3 & 3 \end{bmatrix}$ is singular when $p =$

$3p + 9 = 0$

$p = -3$

Ans: (D) -3

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25. $\begin{bmatrix} -2 & -2 \\ 6 & p \end{bmatrix}$ is singular when $p =$

$12 - 2p = 0$

$p = 6$

Ans: (B) 6
