EXPRESSWALA ACADEMY

Maths 1A: Determinants

MCQ Test, Set 07

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. $\begin{vmatrix} -7 & -5 \\ 4 & -3 \end{vmatrix} =$

A. -41 **B.** -43 **C.** 1 **D.** 41

2. If $\begin{vmatrix} x & -2 \\ -4 & x \end{vmatrix} = 28$, then

A. $x = \pm 2\sqrt{5}$ **B.** $x = 6$ only **C.** $x = \pm 6$ **D.** $x = \pm 7$

3. The cofactor of the element 3 in $\begin{bmatrix} -4 & -4 & 6 \\ 9 & 2 & 5 \\ 0 & 3 & -5 \end{bmatrix}$ is

A. 34 **B.** 74 **C.** -34 **D.** -74

4. In $\begin{bmatrix} 9 & 2 & -1 \\ -2 & 6 & -1 \\ 4 & 3 & 0 \end{bmatrix}$, the minor M_{21} is

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

5. $\begin{vmatrix} 1 & -2 & 6 \\ 0 & 6 & 1 \\ -3 & -1 & 5 \end{vmatrix} =$

A. -145 **B.** 30 **C.** 133 **D.** 145

6. The value of $\begin{vmatrix} -1 & 3 & 0 \\ -4 & 3 & 2 \\ -3 & 5 & -1 \end{vmatrix}$ is

A. -17 **B.** 17 **C.** 43 **D.** 3

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

A. 7 **B.** -21 **C.** -14 **D.** -7

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

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

9. Using $C_2 \to C_2 - 5C_3$, the value of $\begin{vmatrix} -2 & -12 & -2 \\ 0 & 16 & 3 \\ 3 & 0 & -1 \end{vmatrix}$ is

A. 30 **B.** -20 **C.** 20 **D.** 40

10. Using $C_2 \to C_2 - 9C_3$, the value of $\begin{vmatrix} 0 & 34 & 4 \\ 3 & 43 & 4 \\ 7 & 67 & 7 \end{vmatrix}$ is

A. -324 **B.** -162 **C.** -152 **D.** 162

11. For $A = \begin{bmatrix} 5 & -3 & 3 \\ -1 & -5 & 0 \\ -3 & -4 & -4 \end{bmatrix}$ with cofactors A_{ij}, $a_{31}A_{11} + a_{32}A_{12} + a_{33}A_{13} =$

A. 0 **B.** -79 **C.** 79 **D.** 158

12. The roots of $\begin{vmatrix} x & 1 & -5 \\ 1 & x & -5 \\ 1 & -5 & x \end{vmatrix} = 0$ are

A. $-1,\ 5,\ -4$ **B.** $1,\ -5,\ 4$ **C.** $1,\ -5$ **D.** $1,\ -5,\ -4$

13. If A is a square matrix of order 3 and $|A| = 7$, then $|-2A| =$

A. 28 **B.** 56 **C.** -14 **D.** -56

14. If $|A| = 4$ for a matrix A of order 2, the determinant of the matrix of cofactors of A is

A. 4 **B.** 16 **C.** 64 **D.** -4

15. The determinant of $\begin{bmatrix} 5 & 0 & 0 \\ 7 & 6 & 0 \\ 6 & -4 & -3 \end{bmatrix}$ is

A. -85 **B.** 8 **C.** -90 **D.** 90

16. The determinant of $\begin{bmatrix} 3 & 7 & 12 \\ 0 & -1 & -6 \\ 0 & 0 & 2 \end{bmatrix}$ is

A. 1 **B.** -6 **C.** 6 **D.** 4

17. $\begin{vmatrix} 8 & 9 & 4 \\ 7 & 10 & 4 \\ 7 & 9 & 5 \end{vmatrix} =$

A. 20 **B.** 21 **C.** 252 **D.** 253

18. $\begin{vmatrix} 1 & 3 & 7 \\ 3 & 7 & 1 \\ 7 & 1 & 3 \end{vmatrix} =$

A. 308 **B.** 434 **C.** -371 **D.** -308

19. $\begin{vmatrix} p+1 & q & r \\ p & q+1 & r \\ p & q & r+1 \end{vmatrix} =$

A. $p+q+r$ **B.** $1+pqr$ **C.** $(1+p)(1+q)(1+r)$ **D.** $1+p+q+r$

20. Multiplying $\begin{vmatrix} -4 & 3 \\ 4 & 2 \end{vmatrix}$ and $\begin{vmatrix} -1 & -2 \\ -4 & 1 \end{vmatrix}$ row by row, the element in row 1, column 2 of the product is

A. 19 **B.** 11 **C.** -8 **D.** -19

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

A. $8x^3 - 2x^2e^{2x} + 3x^2 - 2xe^{2x} - 2e^{2x}$ **B.** $-8x^3 + 2x^2e^{2x} - 3x^2 + 2xe^{2x} + 2e^{2x}$
C. $2x^3 - 2x^2e^{2x} - 2e^{2x}$ **D.** $6x^2 - 4xe^{2x}$

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

A. $-2xe^x + 3x\cos x - 2\cos x$ **B.** $-2xe^x + 3\cos x$
C. $-x^2e^x - 2xe^x + 3x\cos x - e^x + 3\sin x - 2\cos x$ **D.** $x^2e^x + 2xe^x - 3x\cos x + e^x - 3\sin x + 2\cos x$

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

A. $5 - 2e$ **B.** $-4 + 2e$ **C.** $-5 + 2e$ **D.** $-10 + 4e$

24. $\begin{bmatrix} -1 & 2 \\ 7 & p \end{bmatrix}$ is singular when $p =$

A. 14 **B.** -14 **C.** -13 **D.** -28

25. $\begin{bmatrix} 4 & 4 \\ 4 & p \end{bmatrix}$ is singular when $p =$

A. 8 **B.** -4 **C.** 4 **D.** 5

Key sheet

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

Solutions

1. $\begin{vmatrix} -7 & -5 \\ 4 & -3 \end{vmatrix} =$

$(-7)\cdot(-3) - (-5)\cdot 4 = 41$

Ans: (D) 41

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2. If $\begin{vmatrix} x & -2 \\ -4 & x \end{vmatrix} = 28$, then

$x^2 - 8 = 28$

$x^2 = 36 \Rightarrow x = \pm 6$

Ans: (C) $x = \pm 6$

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3. The cofactor of the element 3 in $\begin{bmatrix} -4 & -4 & 6 \\ 9 & 2 & 5 \\ 0 & 3 & -5 \end{bmatrix}$ is

$M_{32} = \begin{vmatrix} -4 & 6 \\ 9 & 5 \end{vmatrix} = -74$

$A_{32} = (-1)^5(-74) = 74$

Ans: (B) 74

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4. In $\begin{bmatrix} 9 & 2 & -1 \\ -2 & 6 & -1 \\ 4 & 3 & 0 \end{bmatrix}$, the minor M_{21} is

$M_{21} = \begin{vmatrix} 2 & -1 \\ 3 & 0 \end{vmatrix} = 0 - (-3) = 3$

Ans: (A) 3

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5. $\begin{vmatrix} 1 & -2 & 6 \\ 0 & 6 & 1 \\ -3 & -1 & 5 \end{vmatrix} =$

$\Delta = 6\begin{vmatrix} 1 & 6 \\ -3 & 5 \end{vmatrix} - \begin{vmatrix} 1 & -2 \\ -3 & -1 \end{vmatrix}$

$= 6(5 - (-18)) - (-1 - 6)$

$= 6(23) - (-7) = 145$

Ans: (D) 145

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6. The value of $\begin{vmatrix} -1 & 3 & 0 \\ -4 & 3 & 2 \\ -3 & 5 & -1 \end{vmatrix}$ is

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

$= -(-3 - 10) - 3(4 - (-6))$

$= -(-13) - 3(10) = -17$

Ans: (A) -17

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

Rows and columns are interchanged: $|A^T| = |A|$.

$\therefore \text{value} = 1 \times (-7) = -7$

Ans: (D) -7

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

Interchanging two rows changes the sign.

$\therefore \text{value} = (-1) \times (-2) = 2$

Ans: (D) 2

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9. Using $C_2 \to C_2 - 5C_3$, the value of $\begin{vmatrix} -2 & -12 & -2 \\ 0 & 16 & 3 \\ 3 & 0 & -1 \end{vmatrix}$ is

$C_2 \to C_2 - 5C_3$ leaves the value unchanged and gives $\begin{vmatrix} -2 & -2 & -2 \\ 0 & 1 & 3 \\ 3 & 5 & -1 \end{vmatrix}$.

$\Delta = 20$

Ans: (C) 20

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10. Using $C_2 \to C_2 - 9C_3$, the value of $\begin{vmatrix} 0 & 34 & 4 \\ 3 & 43 & 4 \\ 7 & 67 & 7 \end{vmatrix}$ is

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

$\Delta = -162$

Ans: (B) -162

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11. For $A = \begin{bmatrix} 5 & -3 & 3 \\ -1 & -5 & 0 \\ -3 & -4 & -4 \end{bmatrix}$ with cofactors A_{ij}, $a_{31}A_{11} + a_{32}A_{12} + a_{33}A_{13} =$

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

$a_{31}A_{11} + a_{32}A_{12} + a_{33}A_{13} = 0$

Ans: (A) 0

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12. The roots of $\begin{vmatrix} x & 1 & -5 \\ 1 & x & -5 \\ 1 & -5 & x \end{vmatrix} = 0$ are

$C_1 \to C_1 + C_2 + C_3$ gives the factor $x - 4$; then $R_2 - R_1$, $R_3 - R_1$ leave $(x-1)(x+5)$.

$x = 1,\ -5,\ 4$

Ans: (B) $1,\ -5,\ 4$

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13. If A is a square matrix of order 3 and $|A| = 7$, then $|-2A| =$

$|-2A| = (-2)^3|A| = -56$

Ans: (D) -56

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14. If $|A| = 4$ for a matrix A of order 2, the determinant of the matrix of cofactors of A is

$|\text{cofactor matrix}| = |A|^{n-1} = 4^1 = 4$

Ans: (A) 4

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15. The determinant of $\begin{bmatrix} 5 & 0 & 0 \\ 7 & 6 & 0 \\ 6 & -4 & -3 \end{bmatrix}$ is

Triangular: product of the diagonal elements.

$5 \times 6 \times (-3) = -90$

Ans: (C) -90

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16. The determinant of $\begin{bmatrix} 3 & 7 & 12 \\ 0 & -1 & -6 \\ 0 & 0 & 2 \end{bmatrix}$ is

Triangular: product of the diagonal elements.

$3 \times (-1) \times 2 = -6$

Ans: (B) -6

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17. $\begin{vmatrix} 8 & 9 & 4 \\ 7 & 10 & 4 \\ 7 & 9 & 5 \end{vmatrix} =$

Result 8 with $a, b, c = 7, 9, 4$:

$1 + a + b + c = 21$

Ans: (B) 21

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18. $\begin{vmatrix} 1 & 3 & 7 \\ 3 & 7 & 1 \\ 7 & 1 & 3 \end{vmatrix} =$

Use result 1, $-(a^3 + b^3 + c^3 - 3abc)$ with $a, b, c = 1, 3, 7$.

$-(1 + 27 + 343 - 63) = -308$

Ans: (D) -308

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19. $\begin{vmatrix} p+1 & q & r \\ p & q+1 & r \\ p & q & r+1 \end{vmatrix} =$

Result 8 with $a, b, c = p, q, r$: $1 + a + b + c$.

Ans: (D) $1 + p + q + r$

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20. Multiplying $\begin{vmatrix} -4 & 3 \\ 4 & 2 \end{vmatrix}$ and $\begin{vmatrix} -1 & -2 \\ -4 & 1 \end{vmatrix}$ row by row, the element in row 1, column 2 of the product is

Row 1 of the first times row 2 of the second:

$(-4)\cdot(-4) + 3\cdot 1 = 19$

Ans: (A) 19

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

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

$= 8x^3 - 2x^2e^{2x} + 3x^2 - 2xe^{2x} - 2e^{2x}$

Ans: (A) $8x^3 - 2x^2e^{2x} + 3x^2 - 2xe^{2x} - 2e^{2x}$

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

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

$= -x^2e^x - 2xe^x + 3x\cos x - e^x + 3\sin x - 2\cos x$

Ans: (C) $-x^2e^x - 2xe^x + 3x\cos x - e^x + 3\sin x - 2\cos x$

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

Only one row contains x, so integrate that row:

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

$= -5 + 2e$

Ans: (C) $-5 + 2e$

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24. $\begin{bmatrix} -1 & 2 \\ 7 & p \end{bmatrix}$ is singular when $p =$

$-p - 14 = 0$

$p = -14$

Ans: (B) -14

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25. $\begin{bmatrix} 4 & 4 \\ 4 & p \end{bmatrix}$ is singular when $p =$

$4p - 16 = 0$

$p = 4$

Ans: (C) 4
