EXPRESSWALA ACADEMY

Maths 1A: Inverse of a Matrix

MCQ Test, Set 01

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. If $A = \begin{bmatrix} -5 & 3 \\ 2 & 6 \end{bmatrix}$, then $\operatorname{Adj} A =$

A. $\begin{bmatrix} 6 & 3 \\ 2 & -5 \end{bmatrix}$ **B.** $\begin{bmatrix} -5 & -3 \\ -2 & 6 \end{bmatrix}$

C. $\begin{bmatrix} 6 & -3 \\ -2 & -5 \end{bmatrix}$ **D.** $\begin{bmatrix} 6 & -2 \\ -3 & -5 \end{bmatrix}$

2. If $A = \begin{bmatrix} 4 & 1 & 5 \\ 1 & -1 & -3 \\ 2 & -1 & -3 \end{bmatrix}$, the element in row 3, column 2 of $\operatorname{Adj} A$ is

A. 17 **B.** 6 **C.** -6 **D.** -17

3. If A is a 2×2 matrix with $|A| = -3$, then $|(2A)^{-1}| =$

A. $-\frac{1}{12}$ **B.** $-\frac{1}{6}$ **C.** -12 **D.** $-\frac{2}{3}$

4. If $A^{-1} = \begin{bmatrix} 5 & -4 \\ 2 & 0 \end{bmatrix}$, then $(3A)^{-1} =$

A. $\frac{1}{9}\begin{bmatrix} 5 & -4 \\ 2 & 0 \end{bmatrix}$ **B.** $\frac{1}{3}\begin{bmatrix} 5 & -4 \\ 2 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 15 & -12 \\ 6 & 0 \end{bmatrix}$ **D.** $\frac{1}{3}\begin{bmatrix} 5 & 2 \\ -4 & 0 \end{bmatrix}$

5. If $A^{-1} = \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix}$ and $B^{-1} = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$, then $(AB)^{-1} =$

A. $\begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ **B.** $\begin{bmatrix} -5 & -9 \\ 4 & 7 \end{bmatrix}$

C. $\begin{bmatrix} -5 & 4 \\ -9 & 7 \end{bmatrix}$ **D.** $\begin{bmatrix} 1 & 2 \\ 0 & 4 \end{bmatrix}$

6. The value of x for which $\begin{bmatrix} 5 & 4 & -2 \\ 0 & x & 4 \\ 5 & 0 & 2 \end{bmatrix}$ has no inverse is

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

7. $\begin{bmatrix} x & 8 \\ 9 & 2 \end{bmatrix}$ is singular when $x =$

A. 36 **B.** $\frac{1}{36}$ **C.** $\frac{16}{9}$ **D.** -36

8. The inverse of $\begin{bmatrix} 1 & -4 \\ 3 & -5 \end{bmatrix}$ is

A. $\frac{1}{7}\begin{bmatrix} -5 & -3 \\ 4 & 1 \end{bmatrix}$

B. $\frac{1}{7}\begin{bmatrix} -5 & -4 \\ 3 & 1 \end{bmatrix}$

C. $\frac{1}{7}\begin{bmatrix} -5 & 4 \\ -3 & 1 \end{bmatrix}$

D. $\frac{1}{7}\begin{bmatrix} 1 & 4 \\ -3 & -5 \end{bmatrix}$

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9. If $A = \begin{bmatrix} -5 & 5 \\ -2 & 4 \end{bmatrix}$, the element in row 2, column 1 of A^{-1} is

A. 2 **B.** $-\frac{1}{5}$ **C.** $\frac{1}{5}$ **D.** $-\frac{1}{2}$

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10. If $A = \begin{bmatrix} -2 & -1 & 0 \\ -1 & -2 & 1 \\ 4 & 4 & 2 \end{bmatrix}$, the element in row 1, column 3 of A^{-1} is

A. $-\frac{1}{10}$ **B.** -10 **C.** $\frac{1}{10}$ **D.** $\frac{2}{5}$

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11. If $\operatorname{Adj} A = \begin{bmatrix} -2 & 2 & 0 \\ -6 & 10 & -3 \\ 2 & -4 & 1 \end{bmatrix}$ and $|A| = -2$, then $A^{-1} =$

A. $-\frac{1}{2}\begin{bmatrix} -2 & -6 & 2 \\ 2 & 10 & -4 \\ 0 & -3 & 1 \end{bmatrix}$

B. $-2\begin{bmatrix} -2 & 2 & 0 \\ -6 & 10 & -3 \\ 2 & -4 & 1 \end{bmatrix}$

C. $-\frac{1}{2}\begin{bmatrix} -2 & 2 & 0 \\ -6 & 10 & -3 \\ 2 & -4 & 1 \end{bmatrix}$

D. $\frac{1}{2}\begin{bmatrix} -2 & 2 & 0 \\ -6 & 10 & -3 \\ 2 & -4 & 1 \end{bmatrix}$

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12. The inverse of $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & -3 \end{bmatrix}$ is

A. $\frac{1}{12}\begin{bmatrix} -4 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & 4 \end{bmatrix}$

B. $\begin{bmatrix} -12 & 0 & 0 \\ 0 & -9 & 0 \\ 0 & 0 & 12 \end{bmatrix}$

C. $\begin{bmatrix} -3 & 0 & 0 \\ 0 & -4 & 0 \\ 0 & 0 & 3 \end{bmatrix}$

D. $\frac{1}{12}\begin{bmatrix} 4 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & -4 \end{bmatrix}$

13. $A = \frac{1}{3}\begin{bmatrix} 2 & -1 & 2 \\ -2 & -2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$ is an orthogonal matrix. Then $A^{-1} =$

A. $\frac{1}{3}\begin{bmatrix} -2 & 2 & 1 \\ 1 & 2 & -2 \\ -2 & -1 & -2 \end{bmatrix}$

B. $\frac{1}{3}\begin{bmatrix} -2 & 1 & -2 \\ 2 & 2 & -1 \\ 1 & -2 & -2 \end{bmatrix}$

C. $\frac{1}{3}\begin{bmatrix} 2 & -2 & -1 \\ -1 & -2 & 2 \\ 2 & 1 & 2 \end{bmatrix}$

D. $\frac{1}{3}\begin{bmatrix} 2 & -1 & 2 \\ -2 & -2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$

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14. If $A = \begin{bmatrix} 0 & 1 \\ -5 & -5 \end{bmatrix}$, then $(\text{Adj } A)A =$

A. $-5I$ **B.** I **C.** $25I$ **D.** $5I$

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15. If A is a 2×2 matrix with $|A| = 6$, then $(\text{Adj } A)A$ =

A. $36I$ **B.** $\frac{1}{6}I$ **C.** $6I$ **D.** $-6I$

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16. A is a square matrix of order 3 and $\det A = 5$. The determinant of $\text{Adj}(\text{Adj } A)$ is

A. 625 **B.** 1953125 **C.** 3125 **D.** 25

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17. For a square matrix A of order 4 (a 4×4 matrix), $|\text{Adj } A| = 8$. Then $|A| =$

A. 2 **B.** -2 **C.** 64 **D.** 4

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18. If A is a non-singular matrix of order 4 and $|A| = -3$, then $\text{Adj}(\text{Adj } A) =$

A. $-19683A$ **B.** $81A$ **C.** $-27A$ **D.** $9A$

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19. If A is a square matrix of order 3, then $\text{Adj}(-3A) =$

A. $-3 \text{ Adj } A$ **B.** $81 \text{ Adj } A$

C. $-27 \text{ Adj } A$ **D.** $9 \text{ Adj } A$

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20. If $\text{Adj } A = \begin{bmatrix} -1 & -5 \\ -5 & -1 \end{bmatrix}$ and $\text{Adj } B = \begin{bmatrix} 5 & -1 \\ 3 & 5 \end{bmatrix}$, then $\text{Adj}(AB) =$

A. $\begin{bmatrix} 4 & -6 \\ -2 & 4 \end{bmatrix}$ **B.** $\begin{bmatrix} 0 & -24 \\ -28 & -20 \end{bmatrix}$

C. $\begin{bmatrix} 0 & -28 \\ -24 & -20 \end{bmatrix}$ **D.** $\begin{bmatrix} -20 & -24 \\ -28 & 0 \end{bmatrix}$

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21. The characteristic equation of $\begin{bmatrix} 8 & 8 \\ 1 & 5 \end{bmatrix}$ is

A. $\lambda^2 - 13\lambda - 32 = 0$ **B.** $\lambda^2 - 13\lambda + 32 = 0$

C. $\lambda^2 - 32\lambda + 13 = 0$ **D.** $\lambda^2 + 13\lambda + 32 = 0$

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22. For $A = \begin{bmatrix} 0 & 3 & 1 \\ -2 & 0 & -1 \\ -2 & 2 & -1 \end{bmatrix}$, the value of S_2 in $\lambda^3 - S_1\lambda^2 + S_2\lambda - S_3 = 0$ is

A. -4 **B.** -10 **C.** -1 **D.** 10

23. If $A^2 - 6A + 12I = O$, then $A^{-1} =$

A. $\frac{1}{12}(6I - A)$ **B.** $-\frac{1}{12}(6I - A)$ **C.** $\frac{1}{6}(12I - A)$ **D.** $\frac{1}{12}(-6I + A)$

24. If $A = \begin{bmatrix} -4 & 1 \\ 0 & 7 \end{bmatrix}$ and $A^2 - kA + mI = O$, then $(k, m) =$

A. $(3, -28)$ **B.** $(-28, 3)$ **C.** $(3, 28)$ **D.** $(-3, -28)$

25. If a non-singular 3×3 matrix A satisfies $A^3 + 5A^2 + 8A + 4I = O$, then $A^{-1} =$

A. $\frac{1}{8}(A^2 + 5A - 4I)$ **B.** $-\frac{1}{4}(A^2 + 5A + 8I)$

C. $-\frac{1}{4}(A^2 - 5A + 8I)$ **D.** $\frac{1}{4}(A^2 + 5A + 8I)$

Key sheet

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

Solutions

1. If $A = \begin{bmatrix} -5 & 3 \\ 2 & 6 \end{bmatrix}$, then $\text{Adj}\, A =$

For a 2×2 matrix, swap the diagonal entries and change the signs of the other two.

$\text{Adj}\, A = \begin{bmatrix} 6 & -3 \\ -2 & -5 \end{bmatrix}$

Ans: (C) $\begin{bmatrix} 6 & -3 \\ -2 & -5 \end{bmatrix}$

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2. If $A = \begin{bmatrix} 4 & 1 & 5 \\ 1 & -1 & -3 \\ 2 & -1 & -3 \end{bmatrix}$, the element in row 3, column 2 of $\text{Adj}\, A$ is

Row 3, column 2 of $\text{Adj}\, A$ is the cofactor A_{23} (the transpose).

$A_{23} = 6$

Ans: (B) 6

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3. If A is a 2×2 matrix with $|A| = -3$, then $|(2A)^{-1}| =$

$|2A| = (2)^2|A| = -12$

$|(2A)^{-1}| = -\frac{1}{12}$

Ans: (A) $-\frac{1}{12}$

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4. If $A^{-1} = \begin{bmatrix} 5 & -4 \\ 2 & 0 \end{bmatrix}$, then $(3A)^{-1} =$

$(kA)^{-1} = \frac{1}{k}A^{-1}$

$(3A)^{-1} = \frac{1}{3}\begin{bmatrix} 5 & -4 \\ 2 & 0 \end{bmatrix}$

Ans: (B) $\frac{1}{3}\begin{bmatrix} 5 & -4 \\ 2 & 0 \end{bmatrix}$

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5. If $A^{-1} = \begin{bmatrix} -1 & 1 \\ -3 & 2 \end{bmatrix}$ and $B^{-1} = \begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix}$, then $(AB)^{-1} =$

$(AB)^{-1} = B^{-1}A^{-1}$

$= \begin{bmatrix} -5 & 4 \\ -9 & 7 \end{bmatrix}$

Ans: (C) $\begin{bmatrix} -5 & 4 \\ -9 & 7 \end{bmatrix}$

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6. The value of x for which $\begin{bmatrix} 5 & 4 & -2 \\ 0 & x & 4 \\ 5 & 0 & 2 \end{bmatrix}$ has no inverse is

$|A| = 20x + 80 = 0$

$x = -4$

Ans: (D) -4

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7. $\begin{bmatrix} x & 8 \\ 9 & 2 \end{bmatrix}$ is singular when $x =$

$|A| = 2x - 72 = 0$

$x = 36$

Ans: (A) 36

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8. The inverse of $\begin{bmatrix} 1 & -4 \\ 3 & -5 \end{bmatrix}$ is

$|A| = 7$

$A^{-1} = \frac{1}{7}\begin{bmatrix} -5 & 4 \\ -3 & 1 \end{bmatrix}$

Ans: (C) $\frac{1}{7}\begin{bmatrix} -5 & 4 \\ -3 & 1 \end{bmatrix}$

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9. If $A = \begin{bmatrix} -5 & 5 \\ -2 & 4 \end{bmatrix}$, the element in row 2, column 1 of A^{-1} is

$|A| = -10$

$A^{-1} = -\frac{1}{10}\begin{bmatrix} 4 & -5 \\ 2 & -5 \end{bmatrix}$

So the element is $-\frac{1}{5}$.

Ans: (B) $-\frac{1}{5}$

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10. If $A = \begin{bmatrix} -2 & -1 & 0 \\ -1 & -2 & 1 \\ 4 & 4 & 2 \end{bmatrix}$, the element in row 1, column 3 of A^{-1} is

$|A| = 10$

It is $\frac{A_{31}}{|A|} = \frac{-1}{10} = -\frac{1}{10}$

Ans: (A) $-\frac{1}{10}$

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11. If $\operatorname{Adj} A = \begin{bmatrix} -2 & 2 & 0 \\ -6 & 10 & -3 \\ 2 & -4 & 1 \end{bmatrix}$ and $|A| = -2$, then $A^{-1} =$

$A^{-1} = \frac{\operatorname{Adj} A}{|A|}$

$= -\frac{1}{2}\begin{bmatrix} -2 & 2 & 0 \\ -6 & 10 & -3 \\ 2 & -4 & 1 \end{bmatrix}$

Ans: (C) $-\frac{1}{2}\begin{bmatrix} -2 & 2 & 0 \\ -6 & 10 & -3 \\ 2 & -4 & 1 \end{bmatrix}$

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12. The inverse of $\begin{bmatrix} 3 & 0 & 0 \\ 0 & 4 & 0 \\ 0 & 0 & -3 \end{bmatrix}$ is

$\operatorname{diag}(a, b, c)^{-1} = \operatorname{diag}\left(\frac{1}{a}, \frac{1}{b}, \frac{1}{c}\right)$

Ans: (D) $\frac{1}{12}\begin{bmatrix} 4 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & -4 \end{bmatrix}$

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13. $A = \frac{1}{3}\begin{bmatrix} 2 & -1 & 2 \\ -2 & -2 & 1 \\ -1 & 2 & 2 \end{bmatrix}$ is an orthogonal matrix. Then $A^{-1} =$

For an orthogonal matrix, $A^{-1} = A^T$.

$A^{-1} = \frac{1}{3}\begin{bmatrix} 2 & -2 & -1 \\ -1 & -2 & 2 \\ 2 & 1 & 2 \end{bmatrix}$

Ans: (C) $\frac{1}{3}\begin{bmatrix} 2 & -2 & -1 \\ -1 & -2 & 2 \\ 2 & 1 & 2 \end{bmatrix}$

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14. If $A = \begin{bmatrix} 0 & 1 \\ -5 & -5 \end{bmatrix}$, then $(\text{Adj } A)A =$

$A(\text{Adj } A) = (\text{Adj } A)A = |A|\, I$

$|A| = 5$

Ans: (D) $5I$

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15. If A is a 2×2 matrix with $|A| = 6$, then $(\text{Adj } A)A$ =

$A(\text{Adj } A) = (\text{Adj } A)A = |A|\, I$

$= 6I$

Ans: (C) $6I$

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16. A is a square matrix of order 3 and $\det A = 5$. The determinant of $\text{Adj}(\text{Adj } A)$ is

$|\,\text{Adj}(\text{Adj } A)| = |A|^{(n-1)^2}$

$= (5)^4 = 625$

Ans: (A) 625

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17. For a square matrix A of order 4 (a 4×4 matrix), $|\,\text{Adj } A| = 8$. Then $|A| =$

$|\,\text{Adj } A| = |A|^3 = 8$

$|A| = 2$

Ans: (A) 2

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18. If A is a non-singular matrix of order 4 and $|A| = -3$, then $\text{Adj}(\text{Adj } A) =$

$\text{Adj}(\text{Adj } A) = |A|^{n-2}A$

$= 9A$

Ans: (D) $9A$

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19. If A is a square matrix of order 3, then $\text{Adj}(-3A) =$

$\text{Adj}(kA) = k^{n-1}\ \text{Adj } A$

$= 9\ \text{Adj } A$

Ans: (D) $9\ \text{Adj } A$

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20. If $\text{Adj}\, A = \begin{bmatrix} -1 & -5 \\ -5 & -1 \end{bmatrix}$ and $\text{Adj}\, B = \begin{bmatrix} 5 & -1 \\ 3 & 5 \end{bmatrix}$, then $\text{Adj}(AB) =$

$\text{Adj}(AB) = (\text{Adj}\, B)(\text{Adj}\, A)$

$= \begin{bmatrix} 5 & -1 \\ 3 & 5 \end{bmatrix} \begin{bmatrix} -1 & -5 \\ -5 & -1 \end{bmatrix} = \begin{bmatrix} 0 & -24 \\ -28 & -20 \end{bmatrix}$

Ans: (B) $\begin{bmatrix} 0 & -24 \\ -28 & -20 \end{bmatrix}$

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21. The characteristic equation of $\begin{bmatrix} 8 & 8 \\ 1 & 5 \end{bmatrix}$ is

$|A - \lambda I| = \lambda^2 - (a+d)\lambda + (ad - bc) = 0$

$\lambda^2 - 13\lambda + 32 = 0$

Ans: (B) $\lambda^2 - 13\lambda + 32 = 0$

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22. For $A = \begin{bmatrix} 0 & 3 & 1 \\ -2 & 0 & -1 \\ -2 & 2 & -1 \end{bmatrix}$, the value of S_2 in $\lambda^3 - S_1\lambda^2 + S_2\lambda - S_3 = 0$ is

S_2 is the sum of the minors of the leading diagonal elements.

$S_2 = \begin{vmatrix} 0 & 3 \\ -2 & 0 \end{vmatrix} + \begin{vmatrix} 0 & -1 \\ 2 & -1 \end{vmatrix} + \begin{vmatrix} 0 & 1 \\ -2 & -1 \end{vmatrix} = 10$

Ans: (D) 10

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23. If $A^2 - 6A + 12I = O$, then $A^{-1} =$

Multiply by A^{-1}: $A - 6I + 12A^{-1} = O$

$A^{-1} = \frac{1}{12}(6I - A)$

Ans: (A) $\frac{1}{12}(6I - A)$

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24. If $A = \begin{bmatrix} -4 & 1 \\ 0 & 7 \end{bmatrix}$ and $A^2 - kA + mI = O$, then $(k, m) =$

$k = a + d = 3$

$m = ad - bc = -28$

Ans: (A) $(3, -28)$

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25. If a non-singular 3×3 matrix A satisfies $A^3 + 5A^2 + 8A + 4I = O$, then $A^{-1} =$

Multiply by A^{-1}: $A^2 + 5A + 8I = -4A^{-1}$

$A^{-1} = -\frac{1}{4}(A^2 + 5A + 8I)$

Ans: (B) $-\frac{1}{4}(A^2 + 5A + 8I)$