EXPRESSWALA ACADEMY

Maths 1A: Inverse of a Matrix

MCQ Test, Set 03

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 adjoint of $\begin{bmatrix} -2 & 6 \\ -1 & -6 \end{bmatrix}$ is

A. $\begin{bmatrix} -6 & -6 \\ 1 & -2 \end{bmatrix}$ **B.** $\begin{bmatrix} -2 & -6 \\ 1 & -6 \end{bmatrix}$

C. $\begin{bmatrix} -6 & 6 \\ -1 & -2 \end{bmatrix}$ **D.** $\begin{bmatrix} -6 & 1 \\ -6 & -2 \end{bmatrix}$

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

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

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

A. $-\frac{1}{9}$ **B.** -27 **C.** -1 **D.** $-\frac{1}{27}$

4. If $A^{-1} = \begin{bmatrix} 6 & 0 \\ 3 & -3 \end{bmatrix}$, then $(4A)^{-1} =$

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

C. $\frac{1}{16}\begin{bmatrix} 6 & 0 \\ 3 & -3 \end{bmatrix}$ **D.** $\begin{bmatrix} 24 & 0 \\ 12 & -12 \end{bmatrix}$

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

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

C. $\begin{bmatrix} -1 & 1 \\ 4 & -3 \end{bmatrix}$ **D.** $\begin{bmatrix} 0 & -2 \\ -1 & 1 \end{bmatrix}$

6. The value of x for which $\begin{bmatrix} -3 & -1 & -2 \\ 3 & 0 & 3 \\ -3 & x & 3 \end{bmatrix}$ has no inverse is

A. -6 **B.** 6 **C.** -7 **D.** -5

7. $\begin{bmatrix} x & 2 \\ 5 & 9 \end{bmatrix}$ is singular when $x =$

A. $\frac{10}{9}$ **B.** $\frac{18}{5}$ **C.** $-\frac{10}{9}$ **D.** $\frac{9}{10}$

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

A. $\frac{1}{9}\begin{bmatrix} 4 & -3 \\ 1 & -3 \end{bmatrix}$

B. $\frac{1}{9}\begin{bmatrix} -3 & 1 \\ -3 & 4 \end{bmatrix}$

C. $\frac{1}{9}\begin{bmatrix} 4 & 1 \\ -3 & -3 \end{bmatrix}$

D. $\frac{1}{9}\begin{bmatrix} 4 & -1 \\ 3 & -3 \end{bmatrix}$

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

A. $\frac{1}{6}$ **B.** $-\frac{5}{6}$ **C.** -1 **D.** $-\frac{1}{6}$

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

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

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11. If $\operatorname{Adj} A = \begin{bmatrix} 0 & 1 & 2 \\ 8 & -13 & -2 \\ 8 & -9 & -2 \end{bmatrix}$ and $|A| = 8$, then $A^{-1} =$

A. $\frac{1}{8}\begin{bmatrix} 0 & 1 & 2 \\ 8 & -13 & -2 \\ 8 & -9 & -2 \end{bmatrix}$

B. $-\frac{1}{8}\begin{bmatrix} 0 & 1 & 2 \\ 8 & -13 & -2 \\ 8 & -9 & -2 \end{bmatrix}$

C. $\frac{1}{8}\begin{bmatrix} 0 & 8 & 8 \\ 1 & -13 & -9 \\ 2 & -2 & -2 \end{bmatrix}$

D. $8\begin{bmatrix} 0 & 1 & 2 \\ 8 & -13 & -2 \\ 8 & -9 & -2 \end{bmatrix}$

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12. The inverse of $\begin{bmatrix} 5 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ is

A. $\begin{bmatrix} -5 & 0 & 0 \\ 0 & -3 & 0 \\ 0 & 0 & -2 \end{bmatrix}$

B. $\begin{bmatrix} 6 & 0 & 0 \\ 0 & 10 & 0 \\ 0 & 0 & 15 \end{bmatrix}$

C. $\frac{1}{30}\begin{bmatrix} 6 & 0 & 0 \\ 0 & 10 & 0 \\ 0 & 0 & 15 \end{bmatrix}$

D. $\frac{1}{30}\begin{bmatrix} -6 & 0 & 0 \\ 0 & -10 & 0 \\ 0 & 0 & -15 \end{bmatrix}$

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13. If $A(\alpha)=\begin{bmatrix}\cos\alpha & -\sin\alpha & 0\\ \sin\alpha & \cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$, then $\left[A\left(\frac{\pi}{6}\right)\right]^{-1}=$

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

B. $\begin{bmatrix}\frac{\sqrt{3}}{2} & -\frac{1}{2} & 0\\ \frac{1}{2} & \frac{\sqrt{3}}{2} & 0\\ 0 & 0 & 1\end{bmatrix}$

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

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

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14. If $A=\begin{bmatrix}0 & 1\\ -4 & 8\end{bmatrix}$, then $(\operatorname{Adj} A)A=$

A. I **B.** $4I$ **C.** $-4I$ **D.** $16I$

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15. If A is a 3×3 matrix with $|A|=6$, then $(\operatorname{Adj} A)A$ =

A. $\frac{1}{6}I$ **B.** $6I$ **C.** $216I$ **D.** $36I$

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16. If A is a 2×2 matrix with $|A|=4$, then $|\operatorname{Adj}(\operatorname{Adj} A)|=$

A. 256 **B.** 16 **C.** 64 **D.** 4

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17. If A is a 4×4 matrix and $|\operatorname{Adj} A|=64$, then $|A|=$

A. 4 **B.** -4 **C.** 16 **D.** 4096

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

A. $81A$ **B.** $-27A$ **C.** $9A$ **D.** $-3A$

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19. If A is a square matrix of order 2, then $\operatorname{Adj}(-3A)=$

A. $3\ \operatorname{Adj} A$ **B.** $-27\ \operatorname{Adj} A$

C. $-3\ \operatorname{Adj} A$ **D.** $9\ \operatorname{Adj} A$

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20. If $\operatorname{Adj} A=\begin{bmatrix}-1 & 2\\ 0 & 5\end{bmatrix}$ and $\operatorname{Adj} B=\begin{bmatrix}2 & 1\\ -2 & 0\end{bmatrix}$, then $\operatorname{Adj}(AB)=$

A. $\begin{bmatrix}-6 & -1\\ -10 & 0\end{bmatrix}$ **B.** $\begin{bmatrix}-2 & 9\\ 2 & -4\end{bmatrix}$

C. $\begin{bmatrix}-2 & 2\\ 9 & -4\end{bmatrix}$ **D.** $\begin{bmatrix}1 & 3\\ -2 & 5\end{bmatrix}$

21. The characteristic equation of $\begin{bmatrix} 4 & 5 \\ -2 & 0 \end{bmatrix}$ is

A. $\lambda^2 - 10\lambda + 4 = 0$ **B.** $\lambda^2 - 4\lambda + 10 = 0$

C. $\lambda^2 + 4\lambda + 10 = 0$ **D.** $\lambda^2 - 4\lambda - 10 = 0$

22. For $A = \begin{bmatrix} 4 & -1 & 0 \\ 2 & 0 & 1 \\ 3 & 2 & 2 \end{bmatrix}$, the value of S_2 in $\lambda^3 - S_1\lambda^2 + S_2\lambda - S_3 = 0$ is

A. 6 **B.** -7 **C.** 8 **D.** -8

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

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

24. If $A = \begin{bmatrix} 3 & -1 \\ -4 & -1 \end{bmatrix}$ and $A^2 - kA + mI = O$, then $(k, m) =$

A. $(2, 7)$ **B.** $(-2, -7)$ **C.** $(-7, 2)$ **D.** $(2, -7)$

25. If a non-singular 3×3 matrix A satisfies $A^3 - 2A^2 - 5A + 6I = O$, then $A^{-1} =$

A. $-\frac{1}{5}(A^2 - 2A - 6I)$ **B.** $\frac{1}{6}(A^2 - 2A - 5I)$

C. $-\frac{1}{6}(A^2 + 2A - 5I)$ **D.** $-\frac{1}{6}(A^2 - 2A - 5I)$

Key sheet

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

Solutions

1. The adjoint of $\begin{bmatrix} -2 & 6 \\ -1 & -6 \end{bmatrix}$ is

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

$\text{Adj } A = \begin{bmatrix} -6 & -6 \\ 1 & -2 \end{bmatrix}$

Ans: (A) $\begin{bmatrix} -6 & -6 \\ 1 & -2 \end{bmatrix}$

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

Row 3, column 1 of $\text{Adj } A$ is the cofactor A_{13} (the transpose).

$A_{13} = -3$

Ans: (C) -3

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

$|3A| = (3)^2|A| = -27$

$|(3A)^{-1}| = -\frac{1}{27}$

Ans: (D) $-\frac{1}{27}$

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4. If $A^{-1} = \begin{bmatrix} 6 & 0 \\ 3 & -3 \end{bmatrix}$, then $(4A)^{-1} =$

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

$(4A)^{-1} = \frac{1}{4}\begin{bmatrix} 6 & 0 \\ 3 & -3 \end{bmatrix}$

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

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

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

$= \begin{bmatrix} -1 & 4 \\ 1 & -3 \end{bmatrix}$

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

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6. The value of x for which $\begin{bmatrix} -3 & -1 & -2 \\ 3 & 0 & 3 \\ -3 & x & 3 \end{bmatrix}$ has no inverse is

$|A| = 3x + 18 = 0$

$x = -6$

Ans: (A) -6

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7. $\begin{bmatrix} x & 2 \\ 5 & 9 \end{bmatrix}$ is singular when $x =$

$|A| = 9x - 10 = 0$

$x = \frac{10}{9}$

Ans: (A) $\frac{10}{9}$

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

$|A| = -9$

$A^{-1} = -\frac{1}{9}\begin{bmatrix} -4 & -1 \\ 3 & 3 \end{bmatrix}$

Ans: (C) $\frac{1}{9}\begin{bmatrix} 4 & 1 \\ -3 & -3 \end{bmatrix}$

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

$|A| = 6$

$A^{-1} = \frac{1}{6}\begin{bmatrix} 1 & -1 \\ 5 & 1 \end{bmatrix}$

So the element is $-\frac{1}{6}$.

Ans: (D) $-\frac{1}{6}$

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

$|A| = 2$

It is $\frac{A_{21}}{|A|} = \frac{-1}{2} = -\frac{1}{2}$

Ans: (B) $-\frac{1}{2}$

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11. If $\operatorname{Adj} A = \begin{bmatrix} 0 & 1 & 2 \\ 8 & -13 & -2 \\ 8 & -9 & -2 \end{bmatrix}$ and $|A| = 8$, then $A^{-1} =$

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

$= \frac{1}{8}\begin{bmatrix} 0 & 1 & 2 \\ 8 & -13 & -2 \\ 8 & -9 & -2 \end{bmatrix}$

Ans: (A) $\frac{1}{8}\begin{bmatrix} 0 & 1 & 2 \\ 8 & -13 & -2 \\ 8 & -9 & -2 \end{bmatrix}$

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12. The inverse of $\begin{bmatrix} 5 & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 2 \end{bmatrix}$ is

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

Ans: (C) $\frac{1}{30}\begin{bmatrix} 6 & 0 & 0 \\ 0 & 10 & 0 \\ 0 & 0 & 15 \end{bmatrix}$

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13. If $A(\alpha)=\begin{bmatrix}\cos\alpha & -\sin\alpha & 0\\ \sin\alpha & \cos\alpha & 0\\ 0 & 0 & 1\end{bmatrix}$, then $\left[A\left(\frac{\pi}{6}\right)\right]^{-1}=$

$[A(\alpha)]^{-1}=A(-\alpha)$

$=\begin{bmatrix}\frac{\sqrt{3}}{2} & \frac{1}{2} & 0\\ -\frac{1}{2} & \frac{\sqrt{3}}{2} & 0\\ 0 & 0 & 1\end{bmatrix}$

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

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14. If $A=\begin{bmatrix}0 & 1\\ -4 & 8\end{bmatrix}$, then $(\text{Adj}\ A)A=$

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

$|A|=4$

Ans: (B) $4I$

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15. If A is a 3×3 matrix with $|A|=6$, then $(\text{Adj}\ A)A$ =

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

$=6I$

Ans: (B) $6I$

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16. If A is a 2×2 matrix with $|A|=4$, then $|\,\text{Adj}(\text{Adj}\ A)|=$

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

$=(4)^1=4$

Ans: (D) 4

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17. If A is a 4×4 matrix and $|\,\text{Adj}\ A|=64$, then $|A|=$

$|\,\text{Adj}\ A|=|A|^3=64$

$|A|=4$

Ans: (A) 4

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

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

$=-3A$

Ans: (D) $-3A$

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19. If A is a square matrix of order 2, then $\text{Adj}(-3A)=$

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

$=-3\ \text{Adj}\ A$

Ans: (C) $-3\ \text{Adj}\ A$

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20. If $\text{Adj}\, A = \begin{bmatrix} -1 & 2 \\ 0 & 5 \end{bmatrix}$ and $\text{Adj}\, B = \begin{bmatrix} 2 & 1 \\ -2 & 0 \end{bmatrix}$, then $\text{Adj}(AB) =$

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

$= \begin{bmatrix} 2 & 1 \\ -2 & 0 \end{bmatrix} \begin{bmatrix} -1 & 2 \\ 0 & 5 \end{bmatrix} = \begin{bmatrix} -2 & 9 \\ 2 & -4 \end{bmatrix}$

Ans: (B) $\begin{bmatrix} -2 & 9 \\ 2 & -4 \end{bmatrix}$

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21. The characteristic equation of $\begin{bmatrix} 4 & 5 \\ -2 & 0 \end{bmatrix}$ is

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

$\lambda^2 - 4\lambda + 10 = 0$

Ans: (B) $\lambda^2 - 4\lambda + 10 = 0$

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22. For $A = \begin{bmatrix} 4 & -1 & 0 \\ 2 & 0 & 1 \\ 3 & 2 & 2 \end{bmatrix}$, 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.

$S_2 = \begin{vmatrix} 4 & -1 \\ 2 & 0 \end{vmatrix} + \begin{vmatrix} 0 & 1 \\ 2 & 2 \end{vmatrix} + \begin{vmatrix} 4 & 0 \\ 3 & 2 \end{vmatrix} = 8$

Ans: (C) 8

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

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

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

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

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24. If $A = \begin{bmatrix} 3 & -1 \\ -4 & -1 \end{bmatrix}$ and $A^2 - kA + mI = O$, then $(k, m) =$

$k = a + d = 2$

$m = ad - bc = -7$

Ans: (D) $(2, -7)$

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25. If a non-singular 3×3 matrix A satisfies $A^3 - 2A^2 - 5A + 6I = O$, then $A^{-1} =$

Multiply by A^{-1}: $A^2 - 2A - 5I = -6A^{-1}$

$A^{-1} = -\frac{1}{6}(A^2 - 2A - 5I)$

Ans: (D) $-\frac{1}{6}(A^2 - 2A - 5I)$
