# MATHS

# BOOKS - KC SINHA ENGLISH

# MATRICES - FOR COMPETITION

## Solved Examples

**1.** Product of more than two Matrices :

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**2.** Find $X$ if $Y = [3, 2, 1, 4]$ and $2X + Y = [1, 0, -3, 2]$ .

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**3.** If $A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$, find AB and BA and show that $AB \neq BA$

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**4.** If $A = [122212221]$, then prove that $A^2 - 4A - 5I = O$.

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**5.** if $F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, show that F(x).F(x+Y).

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**6.** If A=$\begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then $\lim_{n \to \infty} \frac{A^n}{n}$ is (where $\theta \in R$)

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**7.** if $F(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}$, show that F(x).F(x+Y).

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**8.** If $D_1$ and $D_2$ are diagonal matices of order $3 \times 3$ then (A) $D_1^n$ is a diagonal matrix (B) $D_1 D_2 = D_2 D_1$ (C) $D_1^2 + D_2^2$ is diagonal matrix (D) $D_1 D_2$ is a diagonal matix

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**9.** For a matrix A of order $3 \times 3$ where $A = \begin{bmatrix} 1 & 4 & 5 \\ k & 8 & 8k-6 \\ 1+k^2 & 8k+4 & 2k+21 \end{bmatrix}$ (A) rank of $A = 2f$ or $k = -1(B)rankof$A=1 for k=-1$(C)rankof$A=2 for k=2$(D)rankofA = 1f$ or $k = 2$

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## Exercise

**1.** Given $A = \begin{bmatrix} 1 & 2 & -3 \\ 5 & 0 & \\ 1 & -1 & 1 \end{bmatrix}$ and $B = [[3, -1, 2], [4, 25], [2, 0, 3]]$, find the matrix C such that A+C=B.

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**2.** If $P(x) = [(\cos x, \sin x), (-\sin x, \cos x) : ]]$, then show that $P(x).\, P(y) = P(x+y) = P(y).\, P(x)$.

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**3.** Find the product of the following two matrices $\begin{bmatrix} 0 & c & -b \\ c & 0 & a \\ b & -a & 0 \end{bmatrix}$ and $\begin{bmatrix} a^2 & ab & ac \\ ab & b^2 & bc \\ ac & bc & c^2 \end{bmatrix}$.

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**4.** Let $A = [0 - \tan(\alpha/2)\tan(\alpha/2)0]$ and $I$ be the identity matrix of order 2. Show that $I + A = (I - A)[\cos\alpha - \sin\alpha\sin\alpha\cos\alpha]$ .

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**5.** if $A = \begin{bmatrix} 3 & -4 \\ 1 & -1 \end{bmatrix}$, then prove that $a^n = \begin{bmatrix} 1+2n & -4n \\ n & 1-2n \end{bmatrix}$, where n is any posttive interger.

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**6.** Let $A = [0100]$show that $(aI + bA)^n = a^n I + na^{n-1} bA$, where I is the identitymatrix of order 2 and $n \in N$.

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**7.** A man buys 8 dozens of masngeos, 10 dozensof apples and 4 diozens of bannas. Mngoes cost Rs. 18 per dozen, apples Rs. 9 per dozen and banans

Rs 6 per dozen. Represent the quantities bought by a row matrix and the prices by a column matrix and hence obtain the total cost.

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**8.** Expressing the following matrices as the sum of a symmetric and skew symmetric matrix : $\begin{bmatrix} & 2 & 4 \\ 6 & 8 & 1 \\ 3 & 5 & 7 \end{bmatrix}$

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**9.** Solve the following system of linear equations by matrix method: $3x - 2y = 7, 5x + 3y = 1$

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**10.** Use matrix method to solve the following system of equations: $5x - 7y = 2, \ \ 7x - 5y = 3$

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**11.** Solve the following system of linear equations by matrix method:

$2x + 3y + 3z = 1, 2x + 2y + 3z = 2, x - 2y + 2z = 3$

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**12.** Solve the following system of linear equations by matrix method:

$x + y + z = 3, 2x - y + z = 2, x - 2y + 3z = 2$

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**13.** If A is an invertible symmetric matrix the $A^{-1}$ is

A. a diagonal matrix

B. symmetric

C. skew symmetric

D. none of these

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**14.** If $A$ is a skew-symmetric matrix and $n$ is odd positive integer, then $A^n$ is a skew-symmetric matrix a symmetric matrix a diagonal matrix none of these

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**15.** Which of the following is no true?

(A) $(A')' = A$

(B) $(A - I)(A + I) = 0$ such that $A^2 = I$

(C) $(AB)^n = A^n B^n where n \varepsilon N$ and $AB = BA$

(D) $(A + B)(A - B) = A^2 - B^2$, $A$ and $B$ being square matrices of the same type

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**16.** A square matrix A is invertible if $\det(A)$ is equal to (A) -1 (B) 0 (C) 1 (D) none of these

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17. If A,B and C be the three square matrices such that $A = B + C$ then det A is necessarily equal to (A) detB (B) det C (C) det$B + \det C$ (D) none of these

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18. A square matix A is called idempotent if (A) $A^2 = 0$ (B) $A^2 = I$ (C) $A^2 = A$ (D) $2A = I$

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19. The value of det $\begin{vmatrix} a & 0 & 0 & 0 \\ 2 & b & 0 & 0 \\ 4 & 6 & c & 0 \\ 6 & 8 & 10 & d \end{vmatrix} is (A) 0 (B)$a+b+c+d$(C)$abcd` (D) none of these

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**20.** If A and B are any two square matrices of the same order then (A) $(AB)^T = A^T B^T$ (B) $(AB)^T = B^T A^T$ (C) $Adj(AB) = adj(A)adj(B)$ (D) $AB = 0 \rightarrow A = 0 \text{ or } B = 0$

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**21.** A square matix A is a called singular if det A is (A) negative (B) zero (C) positive (D) non-zero

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**22.** Let A by any $m \times n$ matrix then $A^2$ can be found only when (A) $m < n$ (B) $m = n$ (C) $m > n$ (D) none of these

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**23.** The matrix of the transformation reflection in the line $x + y = 0$ is (A) $\begin{bmatrix} -1 & 0 \\ 0 & -1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ (C) $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$

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**24.** Rank of a non zero matrix is always (A) 0 (B) 1 (C) $> 1$ (D) $> 0$

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**25.** The values of x for which the matrix $\begin{bmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{bmatrix}$ is non-singular are (A) $R - \{0\}$ (B) $R - \{-(a+b+c)\}$ (C) $R - \{0, -(a+b+c)\}$ (D) none of these

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**26.** If $A = \begin{bmatrix} 1 & 1 & 2 \\ 5 & 2 & 6 \\ -2 & -1 & -3 \end{bmatrix}$ then A is (A) nilpotent (B) idempotent (C) symmetric (D) none of these

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**27.** If $A = \begin{bmatrix} 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$ then (A) $A^2 = I$ (B) $A^2 = 0$ (C) $A^3 = 0$ (D) none of these

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**28.** If A and B are square matrices of order 3 then (A) $AB = 0 \rightarrow |A| = 0 \text{ or } |B| = 0$ (B) $AB = 0 \rightarrow |A| = 0 \text{ and } |B| = 0$ (C) $Adj(AB) = AdjAAdjB$ (D) $(A + B)^{-1} = A^{-1} + B^{-1}$

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**29.** If A a non singular matrix an $A^T$ denotes the transpose of A then (A) $|AA^T| \neq |A^2|$ (B) $|A^T A| \neq |A^T|^2$ (C) $|A| + |A^T| \neq 0$ (D) $|A| \neq |A^T|$

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**30.** If A and B are square matrices of the same order then $(A+B)^2 = A^2 + 2AB + B^2$ implies

A. (A) $AB = 0$

B. (B) $AB + BA = 0$

C. (C) $AB = BA$

D. (D) none of these

**Answer: null**

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31. If $A = \begin{bmatrix} 0 & 2 & -3 \\ -2 & 0 & -1 \\ 3 & 1 & 0 \end{bmatrix}$ then A is (A) diagonal matrix (B) symmetric matix (C) skew symmetric matrix (D) none of these

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32. If $A = \begin{bmatrix} 2 & -4 \\ 1 & -1 \end{bmatrix}$ the value of $A^n$ is (A) $\begin{bmatrix} 3^n & (-4)^n \\ 1 & (-1)^n \end{bmatrix}$ (B) $\begin{bmatrix} 3n & -4n \\ n & n \end{bmatrix}$ (C) $\begin{bmatrix} 2+n & 5-n \\ n & -n \end{bmatrix}$ (D) none of these

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33. For a non singular matrix A of order n the rank of A is (A) less than n (B) equal to n (C) greater than n (D) none of these

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**34.** Inverse of diagonal matrix is (A) a diagonal matrix (B) symmetric (C) skew symmetric (D) none of these

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**35.** IF $A=\begin{bmatrix}1 & 0\\1 & 1\end{bmatrix}$ then for all natural numbers $n$ $A^n$ is equal to (A) $\begin{bmatrix}1 & 0\\1 & n\end{bmatrix}$ (B) $\begin{bmatrix}n & 0\\1 & 1\end{bmatrix}$ (C) $\begin{bmatrix}1 & 0\\n & 1\end{bmatrix}$ (D) none of these

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**36.** Prove that the product of matrices $\left[\cos^2\theta\cos\theta\sin\theta\cos\theta\sin\theta\sin^2\theta\right]$ and $\left[\cos^2\varphi\cos\varphi\sin\varphi\cos\varphi\sin\varphi\sin^2\varphi\right]$ is the null matrix, when $\theta$ and $\varphi$ differ by an odd multiple of $\frac{\pi}{2}$ .

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**37.** For an invertible square matrix of order 3 with real entries $A^{-1} = A^2$ then det A= (A) 1/3 (B) 3 (C) 0 (D) 1

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**38.** if $\begin{bmatrix} 2 & 1 \\ 3 & 2 \end{bmatrix} A \begin{bmatrix} -3 & 2 \\ 5 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, \text{then} A = ?$

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**39.** The roots of the equation det $\begin{bmatrix} 1-x & 2 & 3 \\ 0 & 2-x & 0 \\ 0 & 2 & 3-x \end{bmatrix} = 0$ are (A) 1 and 2 (B) 1 and 3 (C) 2 and 3 (D) 1,2, and 3

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**40.** If $A = \begin{bmatrix} 1 & 2 & 0 \\ -1 & 1 & 2 \\ 2 & -1 & 1 \end{bmatrix}$ then det$(Adj(AdjA)) =$ (A) 13 (B) $13^2$ (C) $13^4$ (D) none of these

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41. The transformation due of reflection of $(x, y)$ through the origin is described by the matrix (A) $\begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ (D) $\begin{bmatrix} 0 & -1 \\ -1 & 0 \end{bmatrix}$

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42. If $A = [a_{ij}]_{m \times n}$ and $B = [b_{ij}]_{n \times p}$ then $(AB)'$ is equal to (A) $BA'$ (B) $B'A$ (C) $A'B'$ (D) $B'A'$

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43. If $A$ is a skew-symmetric matrix and $n$ is odd positive integer, then $A^n$ is a skew-symmetric matrix a symmetric matrix a diagonal matrix none of these

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**44.** If $A$ is a skew-symmetric matrix and $n$ is odd positive integer, then $A^n$ is a skew-symmetric matrix a symmetric matrix a diagonal matrix none of these

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**45.** if A and B are two symmetric matrices of the same order , prove that (AB+BA)is also a symmetric matrix.

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**46.** I $A = [x, y, z], B = \begin{bmatrix} a & h & g \\ h & b & f \\ g & f & c \end{bmatrix}$ and $C = [x, y, z]^T, then ABC$ is

(A) not defined (B) a $1 \times 1$ matrix (C) a $3 \times 3$ matrix (D) none of these

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**47.** If for a square matrix $A, A^2 = A then |A|$ is equal to (A) $-3$ or $3$ (B) $-2$ or $2$ (C) $0$ or $1$ (D) none of these

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**48.** For a matrix A of rank r (A) rank $(A') < r$ (B) rank $(A') = r. (C)$ rank $(A') > r$ (D) none of these

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**49.** If A= $\begin{bmatrix} 1 & 3 & 9 & 27 \\ 3 & 9 & 27 & 1 \\ 9 & 27 & 1 & 3 \\ 27 & 1 & 3 & 9 \end{bmatrix}$ then det A= (A) 0 (B) $-(80^3)$ (C) $(80^3)27$ (D) $81^3$

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**50.** If $A = \begin{bmatrix} ab & b^2 \\ -a^2 & -ab \end{bmatrix}$, show that $A^2 = O$.

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**51.** If $A = \begin{bmatrix} 2 & 0 & 0 \\ 0 & \cos & \sin x \\ 0 & -\sin x & \cos x \end{bmatrix}$ then $(AdjA)^{-1} =$ (A) $\frac{1}{2}A$ (B) A (C) 2A (D) 4A

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**52.** Each diagonal element of a skew symmetric matrix is (A) zero (B) negative (C) positive (D) non real

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**53.** If A is a non singular square matrix then $|adj. A|$ is equal to (A) $|A|$ (B) $|A|^{n-2}$ (C) $|A|^{n-1}$ (D) $|A|^n$

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**54.** If $\begin{bmatrix} 1 & -\tan\theta \\ \tan\theta & 1 \end{bmatrix}\begin{bmatrix} 1 & \tan\theta \\ -\tan\theta & 1 \end{bmatrix}^{-1} = \begin{bmatrix} a & -b \\ b & a \end{bmatrix}$, then $a = 1, \quad b = 0$ (b) $a = \cos 2\theta, \quad b = \sin 2\theta$ (c) $a = \sin 2\theta, \quad b = \cos 2\theta$ (d) none of these

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**55.** If $A = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$ and $A.(adjA) = k\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then the value of $k$ is

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**56.** If $I_n$ is the identity matrix of order n then $(I_n)^{-1}$ (A) does not exist (B) $= 0$ (C) $= I_n$ (D) $= nI_n$

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**57.** The number of all possible matrices of order $3 \times 3$with each entry 0 or 1 is:(a) 27 (b) 18 (c) 81 (d) 512

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**58.** The number of all the possible matrices of order $2 \times 2$ with each entry 0,1 or 2 si (A) 12 (B) 64 (C) 81 (D) none of these

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**59.** If A is an invertible matrix then $\det\left(A^{-1}\right)$ is equal to (A) 1 (B) $\frac{1}{|A|}$ (C) $|A|$ (D) none of these

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**60.** If A and B are two invertible matrices of the same order, then adj (AB) is equal to

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**61.** If matrix AB=0, then A=0 or B =0 or both A and B are null matrices.

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**63.** If A is a square matrix which of the following is not as symmetric matrix? (A) $A-A'$ (B) $A+A'$ (C) $AA'$ (D) $A+B$

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**64.** If $A$ is an invertible matrix, then which of the following is not true $(A^2)-1=(A^{-1})^2$ (b) $|A^{-1}|=|A|^{-1}$ (c) $(A^T)^{-1}=(A^{-1})^T$ (d) $|A|\neq 0$

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**65.** If $A = [a_{ij}]_{m \times n}$ is a matrix of rank r then (A) $r < \min\{m, n\}$ (B) $r \leq \min\{m, n\}$ (C) $r = \min\{m, n\}$ (D) none of these

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**66.** If A and B are symmetric matrices, then ABA is

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**67.** Simplify $\cos\theta[\cos\theta \sin\theta \sin\theta \cos\theta] + \sin\theta[\sin\theta - \cos\theta \cos\theta \sin\theta]$

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**69.** If A is any mxn matrix and B is a matrix such that AB and BA are both defined, then B is a matrix of order

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**70.** If A is a skew-symmetric matrix of odd order $n,$ then $|A|=0$

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**71.** If $A=\begin{bmatrix}0 & 1\\1 & 0\end{bmatrix}$ then $A^2$ is equal to

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**72.** If $A=\begin{bmatrix}a & 0 & 0\\0 & b & 0\\0 & 0 & c\end{bmatrix}$ and a,b,c are non zero real numbers, then $A^{-1}$ is

(A) $\frac{1}{abc}\begin{bmatrix}1 & 0 & 0\\0 & 1 & 0\\0 & 0 & 1\end{bmatrix}$ (B) $\frac{1}{abc}\begin{bmatrix}a & 0 & 0\\0 & b & 0\\0 & c & 0\end{bmatrix}$ (C) $\frac{1}{abc}\begin{bmatrix}a^{-1} & 0 & 0\\0 & b^{-1} & 0\\0 & c^{-1} & 1\end{bmatrix}$ (D)

$$\begin{bmatrix} a^{-1} & 0 & 0 \\ 0 & b^{-1} & 0 \\ 0 & 0 & c^{-1} \end{bmatrix}$$

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**73.** The trnsformation orthogonal projection on X-axis is given by the matrix (A) $\begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 0 & 0 \\ 0 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 0 & 0 \\ 1 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 \\ 0 & 0 \end{bmatrix}$

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**74.** If $A = \begin{bmatrix} 1 & 1 \\ 1 & 0 \end{bmatrix}$ and $n \varepsilon N$ then $A^n$ is equal to (A) $2^{n-1}A$ (B) $2^n A$ (C) $nA$ (D) none of these

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**75.** If $A = \begin{bmatrix} 1 & 0 \\ \frac{1}{2} & 1 \end{bmatrix}$ then $A^{50}$ is (A) $\begin{bmatrix} 1 & 25 \\ 0 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 0 \\ 25 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 0 \\ 0 & 50 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 \\ 50 & 1 \end{bmatrix}$

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**76.** If $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is to be square root of two-rowed unit matrix, then $\alpha, \beta$ and $\gamma$ should satisfy the relation. a. $1-\alpha^2+\beta\gamma=0$ b. $\alpha^2+\beta\gamma=0$ c. $1+\alpha^2+\beta\gamma=0$ d. $1-\alpha^2-\beta\gamma=0$

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**77.** if the following system of equations is consistent

$(a+1)^3x+(a+2)^3y=(a+3)^3$

$(a+1)x+(a+2)y=a+3$

$x+y=1$

then find the value of a.

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**78.** Let $A=[a_{ij}]_{n\times n}$ be a square matrix and let $c_{ij}$ be cofactor of $a_{ij}$ in A.

If C=$[C_{ij}]$ , then

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**79.** Let $F(\alpha) = [\cos\alpha - \sin\alpha 0 \sin\alpha \cos\alpha 0001]$ and $G(\beta) = [\cos\beta 0 \sin\beta 010 - \sin\beta 0 \cos\beta]$. Show that $[F(\alpha)]^{-1} = F(-\alpha)$ (ii) $[G(\beta)]^{-1} = G(-\beta)$ (iii) $[F(\alpha)G(\beta)]^{-1} = G(-\beta)F(-\alpha)$.

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**80.** If A is a square matrix of order $n \times n$ and $\lambda$ is a scalar then $|\lambda A|$ is (A) $\lambda|A|$ (B) $\lambda^n|A|$ (C) $|\lambda||A|$ (D) none of these

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**81.** If $A = \begin{bmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{bmatrix}$ and $B = \begin{bmatrix} \cos^2\beta & \cos\beta\sin\beta \\ \cos\beta\sin\beta & \sin^2\beta \end{bmatrix}$

are two matrices such that AB is the null matrix, then

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**82.** If A and B are two matrices such that AB=A, BA=B, then $A^{25}$ is equal to

(A) $A^{-1}$ (B) $A$ (C) $B^{-1}(D)$B`

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**83.** $If A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}, then \lim_{x \to \infty} \frac{1}{n} A^n$ is

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**84.** If $A = \begin{bmatrix} a & b & c \\ x & y & z \\ p & q & r \end{bmatrix}, B = \begin{bmatrix} q & -b & y \\ -p & a & -x \\ r & -c & z \end{bmatrix}$ and if $A$ is invertible, then which of the following is not true? (a) $|A| = |B|$ (b) $|A| = -|B|$ (c) $|adjA| = |adjB|$ (d) $A$ is invertible if and only if $B$ is invertible

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**85.** The number of different mastrices which can be formed using 12 different real numbers is (A) $6(12)!$ (B) $3(12)!$ (C) $2(10)!$ (D) $4(10)!|$

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**86.** Which of the following is a non singular matrix? (A) $\begin{bmatrix}1 & a & b+c\\ 1 & b & c+a\\ 1 & c & a+b\end{bmatrix}$ (B) $\begin{bmatrix}1 & \omega & \omega^2\\ \omega & \omega^2 & 1\\ \omega^2 & 1 & \omega\end{bmatrix}$ where omega is non real and $\omega^3 = 1$ (C) $\begin{bmatrix}1^2 & 2^2 & 3^2\\ 2^2 & 3^2 & 4^2\\ 3^2 & 4^2 & 5^2\end{bmatrix}$ (D) $\begin{bmatrix}0 & 2 & -3\\ -2 & 0 & 5\\ 3 & -5 & 0\end{bmatrix}$

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**87.** If A and B are two $n \times n$ matrices such that $|A| = |B|$ then (A) $A' = A$ (B) $A = B$ (C) $A' = B'$ (D) none of these

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**88.** If $A = [a_{ij}]$ is a square matrix of order 3 and $A_{ij}$ denote cofactor of the element $a_{ij}$ in $|A|$ then the value of $|A|$ is given by

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**89.** If for matrix $A, A^2 + l = 0$, where I is the identity matrix, then A equals

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**90.** The system of linear equations $ax + by = 0, cx + dy = 0$ has a non trivial solution if (A) $ad + bc = 0$ (B) $ad - bc = 0$ (C) $ad - bc, 0$ (D) $ad - bc.0$

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**91.** The equation $2x + y + z = 0, x + y + z = 1, 4x + 3y + 3z = 2$ have (A) no solution (B) only one solution (C) infinitely many solutions (D) none of these

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**92.** The value of a for which the system of linear equations $ax + y + z = 0, ay + z = 0, x + y + z = 0$ possesses non-trivial solution is

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**93.** The system of equations $3x + y - z = 0, 5x + 2y - 3z = 0, 15x + 6y - 9z = 5$ has (A) no solution (B) a unique solution (C) two distinct solutions (D) infinitely many solutions

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**94.** If $A = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix}$ then adj A=

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95. If $I = [1001]$ , $J = [01 - 10]$ and $B = [\cos\theta \sin\theta - \sin\theta \cos\theta]$ , then $B$ equals $I\cos\theta + J\sin\theta$ (b) $I\sin\theta + J\cos\theta$ (c) $I\cos\theta - J\sin\theta$ (d) $I\cos\theta + J\sin\theta$

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96. If $A = [(1, 0, 0), (0, 1, 0), (1, b, 0]$ then $A^2$ is equal is (A) unit matrix (B) null matrix (C) A (D) $-A$

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97. $A, B$ are two matrices such that $AB$ and $A + B$ are both defined; show that $A, B$ are square matrices of the same order.

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**98.** If A and B are symmetric matrices of order $n(A \neq B)$ then (A) A+B is skew symmetric (B) A+B is symmetric (C) A+B is a diagonal matrix (D) A+B is a zero matrix

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**99.** If $A = [1 \quad 2 \quad 3], B = \begin{bmatrix} -5 & 4 & 0 \\ 0 & 2 & -1 \\ 1 & -3 & 2 \end{bmatrix}$ then (A) $AB = \begin{bmatrix} -2 \\ -1 \\ 4 \end{bmatrix}$ (B) $AB = [-2, \ -1, 4]$ (C) $AB = [4, \ -1, 2]$ (D) $AB = \begin{bmatrix} -5 & 4 & 0 \\ 0 & 4 & -2 \\ 3 & -9 & 6 \end{bmatrix}$

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**100.** If $A$ and $B$ are square matrices of order 2, then $\det(A+B) = 0$ is possible only when $\det(A) = 0$ or $\det(B) = 0$ (b) $\det(A) + \det(B) = 0$ (c) $\det(A) = 0$ and $\det(B) = 0$ (d) $A + B = O$

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**101.** From the matrix equation AB=AC, we conclude B=C provided.

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**102.** If each element of a $3 \times 3$ matrix A is multiplied by 3 then the determinant of the newly formed matrix is (A) $3 \det A$ (B) $9 \det A$ (C) $(\det A)^3$ (D) $27 \det A$

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**103.** If A and B are two nonzero square matrices of the same order such that the product $AB = O$, then

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105. The system of linear equations $x+y+z=2, 2x+y-z=3, 3x+2y+kz=4$ has a unique solution if (A) $k \neq 0$ (B) $-1 < k < 1$ (C) $-2 < k < 2$ (D) $k=0$

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106. If $A=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ then A^4= (A) $\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$ (B) $\begin{bmatrix}1 & 1\\ 0 & 10\end{bmatrix}$ (C) $\begin{bmatrix}0 & 0\\ 1 & 1\end{bmatrix}$ (D) $\begin{bmatrix}0 & 1\\ 1 & 0\end{bmatrix}$

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107. The order of $[x, y, z], \begin{bmatrix}a & h & g\\ h & b & f\\ g & f & c\end{bmatrix}, \begin{bmatrix}x\\ y\\ z\end{bmatrix}$ is (A) $3x1$ (B) $1 \times 1$ (C) $1 \times 3$ (D) $3 \times 3$

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108. $\begin{bmatrix}1 & 3\\ 3 & 10\end{bmatrix}^{-1} =$ (A) $\begin{bmatrix}10 & 3\\ 3 & 1\end{bmatrix}$ (B) $\begin{bmatrix}10 & -3\\ -3 & 1\end{bmatrix}$ (C) $\begin{bmatrix}1 & 3\\ 3 & 10\end{bmatrix}$ (D) $\begin{bmatrix}-1 & -3\\ -3 & -10\end{bmatrix}$

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109. If $A + B = \begin{bmatrix}1 & 0\\ 1 & 1\end{bmatrix}$ and $A - 2B = \begin{bmatrix}-1 & 1\\ 0 & -1\end{bmatrix}$, then A is equal to

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110. If $A = \begin{bmatrix}3 & 1\\ -1 & 2\end{bmatrix}$ then $A^2 =$ (A) $\begin{bmatrix}8 & -5\\ -5 & 3\end{bmatrix}$ (B) $\begin{bmatrix}8 & -5\\ 5 & 3\end{bmatrix}$ (C) $\begin{bmatrix}8 & -5\\ -5 & -3\end{bmatrix}$ (D) $\begin{bmatrix}8 & 5\\ -5 & 3\end{bmatrix}$

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111. The inverse of the matrix $\begin{bmatrix}2 & 3\\ -4 & 7\end{bmatrix}$ is (A) $\begin{bmatrix}-2 & -3\\ 4 & -7\end{bmatrix}$ (B) $\frac{1}{26}\begin{bmatrix}7 & -3\\ 4 & 2\end{bmatrix}$ (C) $\begin{bmatrix}7 & 4\\ -3 & 2\end{bmatrix}$ (D) $\begin{bmatrix}7 & -3\\ 4 & 2\end{bmatrix}$

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**112.** the order of the single matrix obtained from $\begin{bmatrix}1 & -1\\0 & 2\\2 & 3\end{bmatrix}\left\{\begin{bmatrix}-1 & 0 & 2\\2 & 0 & 1\end{bmatrix}-\begin{bmatrix}0 & 1 & 23\\1 & 0 & 21\end{bmatrix}\right\}$ is

(A) $2 \times 3$ (B) $2 \times 2$ (C) $3 \times 2$ (D) $3 \times 3$

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**113.** The inverse of the matrix $\begin{bmatrix}1 & 0 & 0\\a & 1 & 0\\b & c & 1\end{bmatrix}$ is (A) $\begin{bmatrix}1 & 0 & 0\\-a & 1 & 0\\b & c & 1\end{bmatrix}$ (B) $\begin{bmatrix}1 & 0 & 0\\-a & 1 & 0\\ac & b & 1\end{bmatrix}$ (C) $\begin{bmatrix}1 & -a & ac-b\\-0 & 1 & -c\\0 & 0 & 1\end{bmatrix}$ (D) $\begin{bmatrix}1 & 0 & 0\\-a & 1 & 0\\ac-b & -c & 1\end{bmatrix}$

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**114.** If the matrix A is both symmetric and skew symmetric, then (A) A is a diagonal matrix (B) A is a zero matrix (C) A is a square matrix (D) None of these

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**115.** If A is a non singular matrix of order 3 then $|adj(adjA)|$ equals (A) $|A|^4$ (B) $|A|^6$ (C) $|A|^3$ (D) none of these

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**116.** If $A=\begin{bmatrix}4 & -5 & -2\\ 5 & -4 & 2\\ 2 & 2 & 8\end{bmatrix}, thenA(adjA)$ equals (A) $\begin{bmatrix}36 & -36 & 18\\ 36 & 36 & -18\\ 18 & -18 & 9\end{bmatrix}$ (B) $\begin{bmatrix}-36 & 36 & 18\\ -36 & 36 & -18\\ -18 & 18 & 9\end{bmatrix}$ (C) $\begin{bmatrix}0 & 0 & 0\\ 0 & 0 & 0\\ 0 & -0 & 0\end{bmatrix}$ (D) none of these

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**117.** If $A=\begin{bmatrix}1 & 2\\ 4 & 1\end{bmatrix}, thenA^{-1}=$ (A) $\begin{bmatrix}-1 & -2\\ 4 & 1\end{bmatrix}$ (B) $-\frac{1}{7}\begin{bmatrix}1 & 2\\ -4 & -1\end{bmatrix}$ (C) $\frac{1}{7}\begin{bmatrix}-1 & -2\\ 4 & 1\end{bmatrix}$ (D) $\frac{1}{9}\begin{bmatrix}1 & 2\\ 4 & 1\end{bmatrix}$

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118. Value of $\begin{vmatrix} 1 & a & a^2 \\ 1 & b & b^2 \\ 1 & c & c^2 \end{vmatrix}$ is (A) $(a-b)(b-c)(c-a)$ (B) $(a^2-b^2)(b^2-c^2)(c^2-a^2)$ (C) $(a-b+c)(b-c+a)(c+a-b)$ (D) none of these

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119. $\begin{bmatrix} 7 & 1 & 2 \\ 9 & 2 & 1 \end{bmatrix}\begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}+2\begin{bmatrix} 4 \\ 2 \end{bmatrix}$ is equal to

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120. Multiplicative inverse of the matrix $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$ is

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**121.** If $f(x) = x^2 + 4x - 5$ and $A = \begin{bmatrix} 1 & 2 \\ 4 & -3 \end{bmatrix}$, then f(A) is equal to

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**122.** The inverse of the matrix $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ is (A) $\begin{bmatrix} 0 & 0 & 1 \\ 0 & 1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ (B) $\begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} \frac{1}{2} & 0 & 0 \\ 0 & \frac{1}{2} & 0 \\ 0 & 0 & \frac{1}{2} \end{bmatrix}$

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**123.** If $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & a & 1 \end{bmatrix}$ and $A^{-1} \begin{bmatrix} 1/2 & -1/2 & 1/2 \\ -4 & 3 & b \\ 5/2 & -3/2 & 1/2 \end{bmatrix}$ then

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**124.** If $A = \begin{bmatrix} 0 & -1 & 2 \\ 1 & 0 & 3 \\ -2 & -3 & 0 \end{bmatrix}, then A + 2A^t$ equals (A) A (B) $-A^t$ (C) $A^t$ (D) $2A^2$

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**125.** The adjoint of the matrix $\begin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix}$ is (A) $\begin{bmatrix} 2 & 5 \\ 3 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & -5 \\ -3 & 2 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & -3 \\ -5 & 2 \end{bmatrix}$ (D) $\begin{bmatrix} -1 & 3 \\ 5 & -2 \end{bmatrix}$

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**126.** If A is a square matrix, then A - A' is a

A. diagonal matrix

B. skew symmetric matrix

C. symmetric matrix

D. none of these

**Answer: A**

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**127.** If $A = \begin{bmatrix} 2 & 3 \\ 5 & -2 \end{bmatrix}$ then $19A^{-1}$ is equal to (A) $A'$ (B) 2A (C) $\frac{1}{2}A$ (D) $A$

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**128.** The matrix $X$ in the equation $AX = B$, such that $A = \begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$ is given by (A) $\begin{bmatrix} 1 & 0 \\ -3 & 1 \end{bmatrix}$ (B) $[(1, -4), 0, 1)]$ (C) $\begin{bmatrix} 1 & -3 \\ 0 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 0 & -1 \\ -3 & 1 \end{bmatrix}$

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**129.** If $\begin{bmatrix} 1 & a & 2 \\ 1 & 2 & 5 \\ 2 & 1 & 1 \end{bmatrix}$ is non invertible then a= (A) 2 (B) 1 (C) 0 (D) -1

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130. Using properties of determinant, if $\begin{vmatrix} -a^2 & ab & ac \\ ab & -b^2 & bc \\ ac & bc & -c^2 \end{vmatrix} = \mu a^2 b^2 c^2$, find $\mu$

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131. If $A = \begin{bmatrix} 1 & \tan\left(\frac{\theta}{2}\right) \\ -\tan\left(\frac{\theta}{2}\right) & 1 \end{bmatrix}$ and $AB = I, then B =$ (A) $\left\{\cos^2\left(\frac{\theta}{2}\right)\right\}A$ (B) $\left\{\cos^2\left(\frac{\theta}{2}\right)\right\}A'$ (C) $\left\{\cos^2\left(\frac{\theta}{2}\right)\right\}I$ (D) none of these

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132. I $A = \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix}$ and $f(x) = 1 + x + x^2 + \ldots + x^{16}, then f(A) =$ (A) 0 (B) $\begin{bmatrix} 1 & 5 \\ 0 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 5 \\ 0 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 0 & 5 \\ 1 & 1 \end{bmatrix}$

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**133.** If A is a non singular square matrix 3 then $\left|adj(A^3)\right|$ equals (A) $|A|^8$ (B) $|A|^6$ (C) $|A|^9$ (D) $|A|^{12}$

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**134.** If A is a square matrix of order $n \times n$ and k is a scalar, then $adj(kA)$ is equal to (1) $kadjA$ (2) $k^n adjA$ (3) $k^{n-1} adjA$ (4) $k^{n+1} adjA$

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**135.** If $A = \begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$, then the trace of the matrix $Adj(AdjA)$ is

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**136.** If $A = \begin{bmatrix} 1 & 0 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 0 \\ 1 & 12 \end{bmatrix}$ then= (A) $AB = 0, BA = 0$ (B) $AB = 0, BA \neq 0$ (C) $AB \neq 0, BA = 0$ (D) $AB \neq 0, BA \neq 0$

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**137.** The value of a for which system of equations , $a^3x+(a+1)^3y+(a+2)^3z=0, ax+(a+1)y+(a+2)z=0, x+y+$

has a non-zero solution is:

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**138.** If $I_3$ is the identity matrix of order 3 then $I_3^{-1}$ is (A) 0 (B) $3I_3$ (C) $I_3$ (D) does not exist

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**139.** If matrix AB=0, then A=0 or B =0 or both A and B are null matrices.

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**140.** The matrix $[05-7-50117-110]$ is (a) a skew-symmetric matrix (b) a symmetric matrix (c) a diagonal matrix (d) an upper triangular matrix

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**141.** $A=[a_{ij}]_{m\times n}$ is a square matrix , if :

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**142.** If $A=\begin{bmatrix}2 & 2\\ -3 & 2\end{bmatrix}$ and $B=\begin{bmatrix}0 & -1\\ 1 & 0\end{bmatrix} then\left(B^{-1}A^{-1}\right)^{-1}=$

(A) $\begin{bmatrix}2 & -2\\ 2 & 3\end{bmatrix}$ (B) $\begin{bmatrix}3 & -2\\ 2 & 3\end{bmatrix}$ (C) $\frac{1}{10}\begin{bmatrix}2 & 2\\ -2 & 3\end{bmatrix}$ (D) $\frac{1}{10}\begin{bmatrix}3 & -2\\ -2 & 2\end{bmatrix}$

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**143.** If $A=[023-4]$ and $kA=[03a2b24]$ , then the values of $k,\ a,\ b$ , are respectively (a) -6, -12, -18 (b) -6, 4, 9 (c) -6, -4, -9 (d) -6, 12, 18

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**144.** If $A = \begin{bmatrix} 1 & 2 \\ 0 & 1 \end{bmatrix}, then A^n =$

(A) $\begin{bmatrix} 1 & 2n \\ 0 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & n \\ 0 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 2n \\ 0 & -1 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & n \\ 0 & 1 \end{bmatrix}$

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**145.** For the matrix $A = \begin{bmatrix} 1 & 1 & 0 \\ 1 & 2 & 1 \\ 2 & 1 & 0 \end{bmatrix}$ which of the following is correct?

(A) $A^3 + 3A^2 - I = 0$ (B) $A^3 - 3A^2 - I = 0$ (C) $A^3 + 2A^2 - I = 0$ (D) $A^3 - A^2 + I = 0$

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**146.** If $A^2 - A + I = 0$, then the inverse of A is

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**147.** If $\begin{bmatrix} 2+x & 3 & 4 \\ 1 & -1 & 2 \\ x & 1 & -5 \end{bmatrix}$ is a singular matrix then x is

(A) $\frac{13}{25}$ (B) $-\frac{25}{13}$ (C) $\frac{5}{13}$ (D) $\frac{25}{13}$

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**148.** If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$ then $A^2$ is equal to

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**149.** If $A = \begin{bmatrix} 1 & 2 \\ 3 & -5 \end{bmatrix}$ then $A^{-1}$ is

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

B. $\begin{bmatrix} \frac{5}{11} & \frac{2}{11} \\ \frac{3}{11} & -\frac{1}{11} \end{bmatrix}$

C. $\begin{bmatrix} -\frac{5}{11} & -\frac{2}{11} \\ -\frac{3}{11} & -\frac{1}{11} \end{bmatrix}$

D. $\begin{bmatrix} 5 & 2 \\ 3 & -1 \end{bmatrix}$

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**150.** If A and B are two square matrices of the same order then $(A - B)^2$ is (A) $A^2 - AB - BA + B^2$ (B) $A^2 - 2AB + B^2$ (C) $A^2 - 2BA + B^2$ (D) $A^2 - B^2$

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**151.** If $A = \begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$ and $I$ is the identity matrix of order 2, then show that $A^2 = 4A - 3I$ Hence find $A^{-1}$.

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**152.** If $P = \begin{bmatrix} i & 0 & -i \\ 0 & -i & i \\ -i & i & 0 \end{bmatrix}$ and $Q = \begin{bmatrix} -i & i \\ 0 & 0 \\ i & -i \end{bmatrix}$ then PQ is equal to (A) $\begin{bmatrix} -2 & 2 \\ 1 & -1 \\ 1 & -1 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & -2 \\ -1 & 1 \\ -1 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 2 & 2 \\ -1 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

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**153.** Let R be a square matrix of order greater than 1 such that R is upper triangular matrix .Further suppose that none of the diagonal elements of the square matrix R vanishes. Then (A) R must be non singular (B) $R^{-1}$ does not exist (C) $R^{-1}$ is an upper triangular matrix (D) $R^{-1}$ is a lower triangular matrix

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**154.** If $A^{-1} = \begin{bmatrix} 1 & -1 & 0 \\ 0 & -2 & 1 \\ 0 & 0 & -1 \end{bmatrix}$ then

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**155.** Let $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$, then

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156. Which of the following is a triangular matrix? (A) a scalar matrix (B) a lower triangular matrix (C) an upper triangular matrix (D) a diagonal matrix

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157. If A and B are square matrices of the same order such that AB=BA, then (A) $(A-B)(A+B)=A^2-B^2$ (B) $(A+B)^2=A^2+2AB+B^2$ (C) $(A+B)^3=A^3A^2B+3AB^2+B^3$ (D) $(AB)^2=A^2B^2$

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158. The homogeneous system AX=) of n linear equation in n variables has (A) a unique solutions if $|A|\neq 0$ (B) infinitely many solution if $|A|=0$ (C) no solution (D) none of these

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**159.** The homogeneous system AX=0of n linear equation in n variables has (A) a unique solutions if $|A| \neq 0$ (B) infinitely many solution if $|A| = 0$ (C) no solution (D) none of these

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**160.** Let A,B,C be $2 \times 2$ matrices with entries from the set of real numbers. Define operations \'*\' as follows $A \cdot B = \frac{1}{2}(AB + BA)$ then (A) $A \cdot I = A$ (B) $A \cdot A = A^2$ (C) $A \cdot B = B \cdot A$ (D) $A \cdot (B + C) = A \cdot B + A \cdot C$

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**161.** If $A = \begin{bmatrix} 0 & \sin\alpha & \sin\alpha\sin\beta \\ -\sin\alpha & 0 & \cos\alpha\cos\beta \\ -\sin\alpha\sin\beta & -\cos\alpha\cos\beta & 0 \end{bmatrix}$ then (A) $|A|$ is independent of $\alpha$ and $\beta$ (B) $A^{-1}$ depends only on beta (C) $A^{-1}$ does not exist (D) none of these

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**162.** Let $A = \begin{vmatrix} 1 & \sin\theta & 1 \\ -\sin\theta & 1 & \sin\theta \\ -1 & -\sin\theta & 1 \end{vmatrix}$, where $0 \leq \theta \leq 2\pi$. Then

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**163.** If $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}$ then (A) $A^{-n} = \begin{bmatrix} 1 & 0 \\ -n & 1 \end{bmatrix}, n\varepsilon N$ (B) $\lim_{n \to 00} \frac{1}{n^2} A^{-n} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ (C) $\lim_{n \to \infty} \frac{1}{n} A^{-n} = \begin{bmatrix} 0 & 0 \\ -1 & 0 \end{bmatrix}$ (D) none of these

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**164.** If A and B are symmetric matrices of same order, then AB - BA is a

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**165.** Let A and B are two matrices such that $AB = BA$, then

for every $n \in N$

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166. Which of the following is a symmetric matrix?

(A) a null matrix (B) a triangular matrix (C) an idenity matrix (D) a diagonal matrix

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167. If A and B are square matrices of the same order then $(A+B)^2 = A^2 + 2AB + B^2$ implies

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168. If A is an invertible matrix of order $n \times n, (n \geq 2), then(A)A$ is symmetric (B) $adjA$ is invertible (C) $Adj(AdjA) = |A|^{n-2}A$ (D) none of these

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**169.** If A is an invertible matrix then which of the following are true? (A) $A \neq 0$ (B) $|A| \neq 0$ (C) $adjA \neq 0$ (D) $A^{-1} = |A| adjA$

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**170.** If A and B are two invertible matrices of the same order, then adj (AB) is equal to

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**171.** Consider the system of equations

$x + y + z = 6$

$x + 2y + 3z = 10$

$x + 2y + \lambda z = \mu$

the system has unique solution if (a) $\lambda \neq 3$ (b) $\lambda = 3, \mu = 10$ (c) $\lambda = 3, \mu \neq 10$ (d) none of these

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**172.** If A is a square matrix of order $2 \times 2$ and $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$, such that $AB = BA$, then A can be

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**173.** A square matrix A is said to be orthogonal if $A^T A = I$ If A is a square matrix of order n and k is a scalar, then $|kA| = K^n |A| Also \left|A^T\right| = |A|$ and for any two square matrix A d B of same order $AB| = |A| \ |B|$ On the basis of above information answer the following question: IF A is a $3 \times 3$ orthogonal matrix such that $|A| = 1, then |A - I| =$ (A) 1 (B) -1 (C) 0 (D) none of these

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**174.** A square matrix A is said to be orthogonal if $A^T A = I$ If A is a sqaure matrix of order n and k is a scalar, then $|kA| = K^n |A| Also \left|A^T\right| = |A|$ and for any two square matrix A d B of same order $AB| = |A| |B|$ On the basis of abov einformation answer the following question: If A is an orthogonal matrix then (A) $A^T$ is an orthogonal matrix but $A^{-1}$ is not an orthogonal matrix (B) $A^T$ is not an orthogonal mastrix but $A^{-1}$ is an orthogonal matrix (C) Neither $A^T$ nor $A^{-1}$ is an orthogonal matrix (D) Both $A^T$ and $A^{-1}$ are orthogonal matices.

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**175.** A square matrix A is said to be orthogonal if $A^T A = I$ If A is a sqaure matrix of order n and k is a scalar, then $|kA| = K^n |A| Also |A^T| = |A|$ and for any two square matrix A d B of same order $AB| = |A| |B|$ On the basis of abov einformation answer the following question:If $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ and P is a orthogonal martix and $B = PAP^T, P^T B^{2009} P =$ (A) $\begin{bmatrix} 1 & 2009 \\ 0 & 1 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 2009 \\ 2009 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 0 \\ 2009 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

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**176.** If A is a square matrix of any order then $|A - x| = 0$ is called the characteristic equation of matrix A and every square matrix satisfies its characteristic equation. For example if $A = \begin{bmatrix} 1 & 2 \\ 1 & 5 \end{bmatrix}$, Then $[(A - xI)], = \begin{bmatrix} 1 & 2 \\ 1 & 5 \end{bmatrix} - \begin{bmatrix} x & 0 \\ 0 & x \end{bmatrix} = \begin{bmatrix} 1 - x & 2 \\ 1 - 0 & 5 - u \end{bmatrix} = \begin{bmatrix} 1 - x & 2 \\ 1 & 5 - x \end{bmatrix}$

Characteristic equation of matri A is $\begin{vmatrix} 1 - x & 2 \\ 1 & 5 - x \end{vmatrix} = 0 \text{ or } (1 - x)(5 - x0 - 2 = 0$ or $x^2 - 6x + 3 = 0.$

Matrix A will satisfy this equation ie. $A^2 - 6A + 3I = 0$ then $A^{-1}$ can be determined by multiplying both sides of this equation let $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & -2 & 4 \end{bmatrix}$ On the basis fo above information answer the following questions: If $6A^{-1} = A^2 + aA + bI, then(a, b)$ is (A) $(-6, 11)$ (B) $(-11, 60$ (C) $(11, 6)$ (D) $(6, 11)$

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**177.** If A is a square matrix of any order then $|A - x| = 0$ is called the chracteristic equation of matrix A and every square matrix satisfies its chatacteristic equation. For example if $A = \begin{bmatrix} 1 & 2 \\ 1 & 5 \end{bmatrix}$, Then

$[(A-xI)], = \begin{bmatrix} 1 & 2 \\ 1 & 5 \end{bmatrix} - \begin{bmatrix} x & 0 \\ 0 & x \end{bmatrix} = \begin{bmatrix} 1-x & 2 \\ 1-0 & 5-x \end{bmatrix} = \begin{bmatrix} 1-x & 2 \\ 1 & 5-x \end{bmatrix}$

Characteristic equation of matrix A is $\begin{vmatrix} 1-x & 2 \\ 1 & 5-x \end{vmatrix} = 0 \text{ or } (1-x)(5-x)(0-2) = 0$ or $x^2 - 6x + 3 = 0$

Matrix A will satisfy this equation ie. $A^2 - 6A + 3I = 0$ .$A^{-1}$ can be determined by multiplying both sides of this equation. Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 1 & -2 & 4 \end{bmatrix}$ On the basis for above information answer the following questions:Sum of elements of $A^{-1}$ is (A) 2 (B) -2 (C) 6 (D) none of these

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**178.** I $A = \begin{bmatrix} 0 & 5 \\ 0 & 0 \end{bmatrix}$ and $f(x) = 1 + x + x^2 + \ldots + x^{16}, then f(A) =$

(A) 0 (B) $\begin{bmatrix} 1 & 5 \\ 0 & 1 \end{bmatrix}$ (C) $\begin{bmatrix} 1 & 5 \\ 0 & 0 \end{bmatrix}$ (D) $\begin{bmatrix} 0 & 5 \\ 1 & 1 \end{bmatrix}$

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**179.** If the matrix $\begin{bmatrix} 1 & 3 & \lambda+2 \\ 2 & 4 & 8 \\ 3 & 5 & 10 \end{bmatrix}$ is singular then find $\lambda$

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**180.** If $A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $A^2 - xA - I = 0$ then find x.

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**181.** For a $3 \times 3$ matrix A if $|A| = 4$, then find $|AdjA|$

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**182.** Assertion: $|M| = 0$, Reason: Determinant of a skew symmetric matrix is 0. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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**183.** Assertion: $|AA^T| = 0$, Reason : A is a skew symmetric matrix (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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**184.** Assertion : $A^{-1}$ exists, Reason: $|A| = 0$ (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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**185.** Assertion: $|AadjA| = -1$, Reason : If A is a non singular square matrix of order n then $|adjA| = |A|^{n-1}$ (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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**186.** Assertion: adj A is a no singular matrix., Reason: A is a no singular matix. (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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**187.** Assertion: If $\left|A^2\right| = 25$ then $A = \pm\frac{1}{5}$, Reason: $|AB| = |A||B|$ (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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**188.** Asertion: The system of equations has unique solution for $\lambda = -5$,

Reason: The determinant $\begin{vmatrix} 3 & -1 & 4 \\ 1 & 2 & -3 \\ 6 & 5 & \lambda \end{vmatrix} \neq 0f \text{ or } \lambda \neq -5$ (A) Both A and R are true and R is the correct explanation of A (B) Both A and R are true R is not te correct explanation of A (C) A is true but R is false. (D) A is false but R is true.

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**189.** If $M$ is a $3 \times 3$ matrix, where det $M = 1 and MM^T = 1, where I$ is an identity matrix, prove theat det $(M - I) = 0$.

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**190.** about to only mathematics

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**191.** If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & -2 & 4 \end{bmatrix}, 6A^{-1} = A^2 + cA + dI$, then (c,d) is :

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**192.** Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ and $U_1, U_2, U_3$ be column matrices satisfying $AU_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, AU_2 = \begin{bmatrix} 2 \\ 3 \\ 6 \end{bmatrix}, AU_3 = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}$.If U is $3 \times 3$ matrix whose columns are $U_1, U_2, U_3$, then $|U| =$

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**193.** If $A = \begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{pmatrix}, U_1, U_2,$ and $U_3$ are column matrices satisfying $AU_1 = \begin{pmatrix} 1 \\ 0 \\ 0 \end{pmatrix}, AU_2 = \begin{pmatrix} 2 \\ 3 \\ 0 \end{pmatrix}$ and $AU_3 = \begin{pmatrix} 2 \\ 3 \\ 1 \end{pmatrix}$ and $U$ is $3 \times 3$ matrix when columns are$U_1, U_2, U_3$ then answer the following questions

The sum of the elements of $U^{-1}$ is

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**194.** Let $A = \begin{bmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ 3 & 2 & 1 \end{bmatrix}$ and $U_1, U_2, U_3$ be column matrices satisfying $AU_1 = \begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, AU_2 = \begin{bmatrix} 2 \\ 3 \\ 6 \end{bmatrix}, AU_3 = \begin{bmatrix} 2 \\ 3 \\ 1 \end{bmatrix}$.If U is $3 \times 3$ matrix whose columns are $U_1, U_2, U_3, \quad \text{then} \quad |U| =$

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**195.** Consider the system of equations

x-2y+3z=-1

-x+y-2z=k

x-3y+4z=1

Statement -1 The system of equation has no solutions for $k \neq 3$.

statement -2 The determinant $\begin{vmatrix} 1 & 3 & -1 \\ -1 & -2 & k \\ 1 & 4 & 1 \end{vmatrix} \neq 0$, for $k \neq 3$.

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**196.** Let A be the set of all $3 \times 3$ symmetric matrices all of whose either 0 or 1. Five of these entries are 1 and four of them are 0.

The number of matrices in A is

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**198.** Let A be the set of all $3 \times 3$ symmetric matrices all of whose either 0 or 1. Five of these entries are 1 and four of them are 0.

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