MATHS

BOOKS - CHHAYA PUBLICATION MATHS (BENGALI ENGLISH)

ADJOINT AND INVERSE OF A MATRIX AND SOLUTION OF LINEAR SIMULTANEOUS EQUATIONS BY MATRIX METHOD

Examples

1. If A = $\begin{bmatrix} 1 & -1 \\ 1 & 2 \end{bmatrix}$ and B = $\begin{bmatrix} 2 \\ 2 \end{bmatrix}$, find Adj. A$A^{-1}$ and A^{-1} B.

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2. If A is an ivertible matrix of order $3 \times 3$and $|A| = 6$, then find the value of $|adj.A|$.

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3. If A = $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin & \cos\theta \end{bmatrix}$, verify that $AA^{-1} = I$, where I is the unit matrix of order 2.

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4. If A = $\begin{bmatrix} 0 & -\tan\frac{\theta}{2} \\ \tan\frac{\theta}{2} & 0 \end{bmatrix}$ and I is the 2×2 unit matrix, find $(I + A)(I - A)^{-1}$.

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5. If A = $\begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$ then find A^{-1}

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6. If the matrix A = $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$ satisfies the equation $A^2 = 5A + 2I$. Then, find the value of A^{-1}.

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7. If A = $\begin{pmatrix} 3 & -1 \\ 1 & 2 \end{pmatrix}, B = \begin{pmatrix} 3 \\ 1 \end{pmatrix}, C = \begin{pmatrix} 1 \\ -2 \end{pmatrix}$ find the matric X such that AX = 3B + 2C.

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8. If A = $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ show that,

(i) adj (adj.A) = A (ii). $\left(A^{-1}\right)^{-1} = A.$

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9. If $A^{-1} = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$, find A.

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10. Find a square matrix A of order 2 such that,

$$A\begin{pmatrix}4 & -2\\ 0 & 5\end{pmatrix}+\begin{pmatrix}-1 & 3\\ -9 & 6\end{pmatrix}=\begin{pmatrix}3 & 16\\ 7 & 8\end{pmatrix},$$

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11. If A = $\begin{bmatrix}2 & 5 & 3\\ 3 & 1 & 2\\ 1 & 2 & -1\end{bmatrix}$ be a square matrix, find Adj.A and A^{-1}

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12. If A = $\begin{bmatrix}1 & 2 & 3\\ 3 & -2 & 1\\ 4 & 2 & 1\end{bmatrix}$

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13. If A = $\begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$ find A^2 and show that $A^2 = A^{-1}$.

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14. If $A^{-1} = \begin{bmatrix} 1 & 3 & 2 \\ -3 & -3 & -1 \\ 2 & 1 & 0 \end{bmatrix}$, find A.

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15. Show that , $A^{-1} = \frac{1}{3}\begin{bmatrix} -1 & 2 & -2 \\ -2 & 1 & -2 \\ 2 & 2 & 1 \end{bmatrix}$ is a proper orthogonal matrix.

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16. Using matrix method show that the system of linear equations 3x - 4y = 7 and 9x - 12y = 16 is inconsistent.

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17. Using matrix method examine whether the following system of equations is consistent or inconsistent or has

infinite number of solutions:

$3x + 2y + 3z = 2$, $5x + 7y + 5z = 3$ and $4x + 5y + 4z = 4$

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18. Using matrix methos show that the following system of equations has infinite number of solutions:

$2x - 3y + 4z = 7$, $3x - 4y + 5z = 8$, $4x - 5y + 6z = 9$

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19. Show that the following system of linear equations is consistent and hence solve the equations:

$2x + 3y = 1$ and $3x - y = 7$

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20. Solve the following system of linear equations by matrix inversion method:

x + 2y + z = 7,x + 3z = 11 and 2x - 3y = 1

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21. If A = $\begin{bmatrix} 1 & 2 & -3 \\ 2 & 3 & 2 \\ 3 & -3 & -4 \end{bmatrix}$, find A^{-1} and hance solve the system of linear equations: x + 2y - 3z = -4, 2x + 3y + 2z = 2, 3x - 3y -4z = 11

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22. Solve the following system of equations by matrix inversion method:

$$\frac{2}{x}+\frac{3}{y}-\frac{4}{z}=-3, \frac{1}{x}+\frac{2}{y}+\frac{6}{z}=2, \frac{3}{x}-\frac{1}{y}+\frac{2}{z}=5$$

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23. Let the metrix A be given by A = $\begin{pmatrix} 2 & 1 \\ 3 & 4 \end{pmatrix}$. Obtain a matrix B such that AB = BA = I where I is the unit matris of order 2. Using this matrix B, solve for x and y from the following equations:

2x + y = 15 and 3x + 4y = 23

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24. Given A = $\begin{bmatrix} 1 & -1 & 1 \\ 1 & -2 & -2 \\ 2 & 1 & 3 \end{bmatrix}$ and B = $\begin{bmatrix} -4 & 4 & 4 \\ -7 & 1 & 3 \\ 5 & -3 & -1 \end{bmatrix}$,

find AB and use this result I solving the following system

of equations :

x - y + z = 4, x - 2y -2z = 9 and 2x + y + 3z = 1

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25. Given A = $\begin{bmatrix} 1 & 1 & 1 \\ 2 & -1 & 1 \\ 2 & 1 & -3 \end{bmatrix}$, X = $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and C = $\begin{bmatrix} 3 \\ -1 \\ -9 \end{bmatrix}$

Write down the linear equations given by AX = C and

solve for x, y,z by method.

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26. If A = $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & -1 \\ -1 & 1 & -7 \end{bmatrix}$, find A^{-1}, hence solve the following system of linear equations:

x + y - z = 3 , 2x + 3y +z 10 and 3x - y - 7z = 1

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27. Find the inverve of the matrix A = $\begin{bmatrix} 6 & -2 \\ 3 & -3 \end{bmatrix}$ using elementary (i) row operations (ii) column operations.

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28. Find the invervse of the matrix A = $\begin{bmatrix} 1 & 5 & 0 \\ 0 & 2 & -1 \\ 1 & 0 & 3 \end{bmatrix}$ using elementary (i) row transformations (ii) elementary column transformations.

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29. Using elementary row operations show that inverse of the matrix

(i) $\begin{bmatrix} -3 & 2 \\ 6 & -4 \end{bmatrix}$ does not exist, (ii) $\begin{bmatrix} 3 & 2 & 1 \\ 0 & 4 & 5 \\ 3 & 6 & 6 \end{bmatrix}$ does not exist

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30. Using elementary row transformations find the inverse of the matrix

$$\begin{bmatrix} 3 & 0 & -1 \\ 2 & 3 & 0 \\ 0 & 4 & 1 \end{bmatrix}$$

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Multiple Choice Type Questions

1. A square matrix A is called singular if -

A. $|A| > 0$

B. $|A| <$

C. $|A| = 0$

D. |A| = a complex number

Answer: C

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2. $\frac{Adj.\ A}{|A|}$=

A. A^T

B. A^{-1}

C. $\left(A^{-1}\right)^T$

D. $\left(A^T\right)^{-1}$

Answer: B

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3. $(AB)^{-1}$ =

A. $A^{-1}B^{-1}$

B. A^{-1}B

C. $B^{-1}A^{-1}$

D. AB^{-1}

Answer: C

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4. If A is an invertible matrix of order 3 and $|A| = 5$, then the value of $|adjA|$ is equal to-

A. 20

B. 21

C. 24

D. 25

Answer: D

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5. Matrices A and B will be inverse of each other only if-

A. AB = BA $\neq$ I

B. AB = BA = O

C. AB = o , BA = I

D. AB = BA = I

Answer: D

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6. Let A be a non-singular square matrix of order 3 $\times$ 3. Then |adj A| is equal to (a) $|A|$ (B) $|A|^2$ (C) $|A|^3$ (D) $3|A|$

A. |A|

B. $|A|^2$

C. $|A|^3$

D. 3|A|

Answer:

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7. If a,b,c, are non-zero real numbers, then the inverse of matrix A = $\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$ is -

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

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

C. $\begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$

D. $\frac{1}{abc}\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

Answer: A

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8. If A be an orthogonal matrix, then the value of A^{-1} will be -

A. A

B. A^T

C. A^2

D. A^3

Answer: B

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9. If A be a proper orthogonal matrix, then-

A. $|A| = 0$

B. $|A|=1$

C. $|A|=2$

D. $|A|=3$

Answer: B

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Very Short Answer Type Questions

1. Prove that the following matrix are singular:

$$\begin{bmatrix} 3 & 2 & 1 \\ 0 & 4 & 5 \\ 3 & 6 & 6 \end{bmatrix}$$

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2. Prove that the following matrix are singular:

$$\begin{bmatrix} 13 & 16 & 19 \\ 14 & 17 & 20 \\ 15 & 18 & 21 \end{bmatrix}$$

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3. If A = $\begin{bmatrix} -2 & 2 & 1 \\ 0 & 4 & 5 \\ -2 & 6 & 6 \end{bmatrix}$ does A^{-1} exist?

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4. If B $\begin{bmatrix} 1 & -1 & 1 \\ 2 & -1 & 0 \\ 1 & 0 & 0 \end{bmatrix}$,does B^{-1} exist?

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5. Show that , A = $\frac{1}{\sqrt{2}}\begin{bmatrix} 1 & 1 \\ -1 & 1 \end{bmatrix}$ is a proper orthogonal matrix. Hence find A^{-1}

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6. If A = $\begin{bmatrix} 4 & 1 \\ 7 & 2 \end{bmatrix}$ find a matrix B such that AB = I where I is the unit matrix of order 2.

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7. Using elementary row transformations find the inverse of matrices:

$\begin{bmatrix} 3 & 4 \\ 2 & 3 \end{bmatrix}$

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8. Using elementary row transformations find the inverse of matrices:

$$\begin{bmatrix} 1 & 2 \\ 3 & 7 \end{bmatrix}$$

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9. Using elementary row transformations find the inverse of matrices:

$$\begin{bmatrix} -2 & -4 \\ 3 & 5 \end{bmatrix}$$

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10. Using elementary row transformations find the inverse of matrices:

$$\begin{bmatrix} 2 & -5 \\ -3 & 7 \end{bmatrix}$$

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11. Find the inverse of following matrices by using elementary column operations :

$$\begin{bmatrix} -6 & 4 \\ 2 & -2 \end{bmatrix}$$

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12. Find the inverse of following matrices by using elementary column operations :

$$\begin{bmatrix} 5 & -4 \\ -3 & 3 \end{bmatrix}$$

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13. Find the inverse of following matrices by using elementary column operations :

$$\begin{bmatrix} -3 & 5 \\ -4 & 5 \end{bmatrix}$$

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14. Find the inverse of following matrices by using elementary column operations :

$$\begin{bmatrix} 7 & 8 \\ 2 & 2 \end{bmatrix}$$

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15. Find the inverse of following matrices by using elementary column operations :

$$\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$$

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16. Find the inverse of matrix:

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

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17. Find the inverse of matrix:

$$\begin{bmatrix} 0 & 2 \\ 3 & 1 \end{bmatrix}$$

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18. Using elementary row transfromations find the inverse of matrix:

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 7 \\ -2 & -4 & -5 \end{bmatrix}$$

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19. Find the inverse of matrices using elementary column transformations:

$$\begin{bmatrix} 2 & -1 & 4 \\ 4 & 0 & 2 \\ 3 & -2 & 7 \end{bmatrix}$$

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20. Find the inverse of matrices using elementary column transformations:

$$\begin{bmatrix} 1 & 2 & 3 \\ 1 & 3 & -1 \\ -1 & 1 & -7 \end{bmatrix}$$

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21. Find the inverse of matrices using elementary column transformations:

$$\begin{bmatrix} 3 & -3 & 4 \\ 2 & -3 & 4 \\ 0 & -1 & 1 \end{bmatrix}$$

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22. If A $= \begin{bmatrix} 5 & -8 \\ -5 & 8 \end{bmatrix}$, show by elementary row transformations that A^{-1} does not existl.

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23. If B $= \begin{bmatrix} -2 & 2 & 1 \\ 0 & 4 & 5 \\ -2 & 6 & 6 \end{bmatrix}$, show by elementary row operations that B^{-1} does not exist.

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24. If A $= \begin{bmatrix} 1 & -2 & 3 \\ 1 & 2 & 1 \\ -1 & 2 & -3 \end{bmatrix}$ show by elementary colomn operations that the matrix A does not possess an inverse.

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25. If A = $\begin{bmatrix} 2 & 2 \\ 4 & 3 \end{bmatrix}$ show that, $AA^{-1} = I_2$ wher I_2 is the unit matrix of order 2.

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26. Find the matrix A when

$$A^{-1} = \frac{1}{11}\begin{bmatrix} 1 & 4 \\ -2 & 3 \end{bmatrix}$$

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27. Find the matrix A when

$$A^{-1} = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}.$$

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28. If A = $\begin{pmatrix} 3 & 1 \\ 0 & 2 \end{pmatrix}$ show that $\left(A^T\right)^{-1} = \left(A^{-1}\right)^T$ where A^T is the transpose of A .

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29. If A = $\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$ and AB = $\begin{bmatrix} -13 & 8 \\ -8 & 5 \end{bmatrix}$, find B.

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30. If A = $\begin{pmatrix} 4 & 5 \\ 2 & 1 \end{pmatrix}$ show that, $6A^{-1} + 5I = A$.

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31. If A = $\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ prove that, AA' = I. Hence, find A^{-1}.

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32. If A = $\begin{bmatrix} 1 & -\tan\frac{\theta}{2} \\ \tan\frac{\theta}{2} & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & \tan\frac{\theta}{2} \\ -\tan\frac{\theta}{2} & 1 \end{bmatrix}$ show that, $AB^{-1} = \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$.

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33. If A = $\begin{bmatrix} -3 & -4 \\ 4 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -3 \\ 5 & -8 \end{bmatrix}$, verify that $(AB)^{-1} = B^{-1}A^{-1}$.

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34. If A = $\begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -2 \\ -1 & 1 \end{bmatrix}$, find the value of $(AB)^{-1}$.

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35. If A = $\begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$, $I = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$ and $O = \begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$ show that, $A^2 - 5A + 7I = O$. Hence find A^{-1}.

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36. If A = $\begin{bmatrix} 4 & 5 \\ 5 & 6 \end{bmatrix}$ show that, $A^2 = 10A + I$ where I is the unit matrix or order 2. Hence, find the inverse of A.

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37. Show that the matrix A= $\begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ satisfies the equation $x^2 - 6x + 17 = 0$. Hence find A^{-1}

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38. Show that, the matrix A = $\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & 2 \\ 2 & 2 & 1 \end{bmatrix}$ satisfies the equation $A^2 - 4A - 5I_3 = 0$ and hence find A^{-1}.

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Short Answer Type Question

1. Show that the matrix A = $\frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ is orthogonal, Hence, find A^{-1}.

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2. Using matrix method show that the equations 6x - 4y + 1 = 0 and 9x - 6y = 2 are inconsistent.

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3. Use matrix method to examine the equations 6x - 4y + 1 = 0 and 9x - 6y = 2 for consistency or inconsisitency.

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4. Show that the system of equations 3x + 2y + 3z = 2, 5x + 7y +5z = 3 and 4x + 5y + 4z = 4 is inconsistent.

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5. In each of the following cases show (using matrix method that the given system of linear equations has infinite number of solutions:

$x + 2y + 3z = 1, 3x + 4y + 5z = 2, 5x + 6y + 7z = 3$

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6. In each of the following cases show that the given system of linear equations has infinite number of solutions:

$2x - y + 3z = 5, 3x + 2y - z = 7, 4x + 5y - 5z = 9$

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7. In cases show that the given system of equations is inconsistent:

$x + 2y + 3z = 1, 2x + 3y + 5z = 1, 3x + 5y + 7z = 1$

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8. In cases show that the given system of equations is inconsistent:

$3x - 5y - 3 = 0, 2y - z + 1 = 0, 3x - y - 2z = 2$

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9. In cases show that the given system of equations is inconsistent:

$2x - y - z + 4 = 0, x - 2y + z + 2 = 0, x + y - 2z = 5$

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Long Answer Type Questions

1. Find the adjoint and inverse of each of the following matrices :

$$\begin{pmatrix} 2 & -1 \\ -4 & 3 \end{pmatrix}$$

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2. Find the adjoint and inverse of each of the following matrices :

$A = \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}$

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3. Find the adjoint and inverse of each of the following matrices :

$\begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$

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4. Find the adjoint and inverse of each of the following matrices :

$\begin{pmatrix} a & b \\ c & d \end{pmatrix}$

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5. Find the adjoint and inverse of each of the following matrices :

A = $\begin{bmatrix} a+ib & c+id \\ -c+id & a-ib \end{bmatrix}$ where $a^2+b^2+c^2+d^2=1$

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6. Find the adjoint and inverse of each of the following matrices :

A = $\begin{bmatrix} 1 & 2 & -1 \\ 2 & 4 & 6 \\ 1 & 1 & -2 \end{bmatrix}$

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7. Solve by matrix inversion method the equations in each of the following:

3x + 4y = 1, x + 3y + 3 = 0

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8. Solve by matrix inversion method the equations in each of the following:

$2x_2 - x_1 = 2,\ 3x_1 - 4x_2 + 5 = 0$

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9. Solve by matrix inversion method the equations in each of the following:

$2a - 5b + 1 = 0, 5a - 7b = 3$

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10. Solve by matrix inversion method the equations in each of the following:

$7x + 4y + 1 = 0, 3x + y = 1$

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11. Show that the equations $5x + 6y = 3 = 0$ and $4y + x = 5$ are consistent and hence, solve for x and y.

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12. The order of the matrix A is 3×5 and that of order B is 2×3 then the order of matrix BA is

A. 2×3

B. 3×2

C. 2×5

D. 5×2

Answer: C

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13. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ then the value of α if $A^2 = B$

A. 4

B. 3

C. 5

D. None of these

Answer: D

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14. Solve by matrix inversion method the following system of equations.

$2x + y = 2, 3x + y = 6$

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15. Solve by matrix inversion method the following system of equations.

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

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16. Solve by matrix inversion method the following system of equations.

$x + y + z = 6, x + 2z = 7, 3x + y + z = 12$

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17. Solve by matrix inversion method the following system of equations.

$8x + 4y + 3z = 18, 2x + y + z = 5, x + 2y + z = 5$

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18. Solve by matrix inversion method the following system of equations.

$x - y + z = 2 , 2x - y = 0, 2y - z = 1$

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19. Solve by matrix inversion method the following system of equations.

$$\frac{2}{x} - \frac{3}{y} = 10, \frac{1}{x} + \frac{1}{y} = 10$$

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20. Solve by matrix inversion method the following system of equations.

$$x_1 + x_2 - 3 = 0, x_1 - 4x_2 + 2 = 0$$

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21. Solve by matrix inversion method the following system of equations.

$x + y - z + 3 = 0, 2x + 3y + z = 2, 8y + 3z = 1$

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22. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then $A^2 + 2A =$

A. A

B. 3A

C. 2A

D. 4A

Answer:

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23. If A is a 3×3 matrix and B is it's adjoint matrix. if |B|=64, then |A|=

A. ± 2

B. ± 4

C. ± 8

D. ± 12

Answer:

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24. If A and B are symmetric matrices 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

Answer: B

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25. From the matrix equation AX = B, find X, given

$A = \begin{bmatrix} 1 & -1 \\ 2 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

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26. If $1, \omega, \omega^2$ are the cube roots of unity then the vlue of m for which the matrix $\begin{bmatrix} 1 & \omega & m \\ \omega & m & 1 \\ m & 1 & \omega \end{bmatrix}$ is singular, is -

A. $\lambda \neq -2$

B. $\lambda \neq 2$

C. $\lambda \neq 3$

D. $\lambda \neq -3$

Answer: x + 2y + 3z = 1, 3x - 2y + z = 2, 4x + 2y + z = 3, $x = \frac{7}{10}, y = \frac{3}{40}, z = \frac{1}{20}$

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27. Given A = $\begin{bmatrix} 1 & 2 & 3 \\ 3 & -2 & 1 \\ 4 & 2 & 1 \end{bmatrix}$, X = $\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and $B = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$

Write down the linear equations given by AX = B.

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28. If A = $\begin{bmatrix} 1 & 2 \\ -2 & 2 \end{bmatrix}$ find A^T.

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29. If $A = \begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$ then $(A - 2I)(A - 3I)$ is equal to__

A. A

B. I

C. O

D. $5I$

Answer: C

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30. Find the product

$$\begin{bmatrix} 1 & -1 & 0 \\ 2 & 3 & 4 \\ 0 & 1 & 2 \end{bmatrix} \times \begin{bmatrix} 2 & 2 & -4 \\ -4 & 2 & -4 \\ 2 & -1 & 5 \end{bmatrix}$$

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31. Let A = $\begin{bmatrix} 2 & 8 \\ 1 & 1 \end{bmatrix}$, find A^{-1}.

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32. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$,then $A^4 =$

A. $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

B. $\begin{bmatrix} 1 & 1 \\ 0 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 0 & 0 \\ 1 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

Answer: A

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33. Prove that the equations kx + y + z = 1, x + ky + z = k and x + y + kz = k^2 will have unique solution when $k \neq 1$ and $k \neq -2$. Solve the equations in this case.

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34. If for a matrix A, $A^5 = I$, then $A^{-1} =$

A. A^2

B. A^3

C. A

D. none of these

Answer: D

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35. If A = $\begin{bmatrix} 3 & 1 \\ 4 & -1 \end{bmatrix}$, then find A^{-1}.

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Multiple Correct Answer Type

1. If A is a matrix of size $n \times n$ such that $A^2 + A + 2I$ = O then

A. A is non-singular

B. $A \neq O$

C. $|A| = O$

D. $A^{-1} = \frac{-1}{2}(A + I)$

Answer: A::B::C::D

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2. If A and B are two matrices such that $AB = B$ and $BA = A$, then $A^2 + B^2 =$

A. 2AB

B. 2BA

C. A+B

D. AB

Answer: C

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

A. adj (A) adj (B)

B. $|B||A|B^{-1}A^{-1}$

C. $|B||A|A^{-1}B^{-1}$

D. $|A||B|(AB)^{-1}$

Answer: A::B::D

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4. If $\begin{bmatrix} x+y & 2x+z \\ x-y & 2z+w \end{bmatrix} = \begin{bmatrix} 4 & 7 \\ 0 & 10 \end{bmatrix}$ then the values of x, y, z and w are -

A. 2,2,3,4

B. 2,3,1,2

C. 3,3,0,1

D. none of these

Answer: A

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5. If A is a 2×2 square matrix with $|A| = 3$ then find $|3A|$

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Integer Answer Type

1. Suppose A is a 4×4 matrix such that |A| = 4 and |adjA| = Bk, then the value of k will be -

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2. The system of equation

$x + y + 2z = 1, x + 2y + 3z = 2, x + 4y + \alpha z = 4.$

Has unique then

A. $\alpha \neq 3$

B. $\alpha \neq 5$

C. $\alpha \neq 2$

D. $\alpha \neq 1$

Answer: B

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3. Let A = $\begin{bmatrix} 2 & q \\ 0 & 1 \end{bmatrix}$ and $A^8 = \begin{bmatrix} x & yq \\ 0 & 1 \end{bmatrix}$, find x - y.

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4. If matrix A satisfies the equation $A^2 + 5A + 6I = 0$ then A^3 is

A. $15A + 12I$

B. $19A + 30I$

C. $17A + 15I$

D. $17A + 21I$

Answer: B

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5. The system of equation

$x + y + z = 6, x + 4y + 6z = 20, x + 4y + mz = n.$

Has no solution then

A. $m = 6, n = 20$

B. $m = 6, n \neq 20$

C. $m \neq 6, n = 20$

D. $m \neq 6, n \neq 20$

Answer: B

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Matrix Match Type

1.

	Column I		Column II
(A)	If $\|A\| = 2$ then $\|2A^{-1}\|$ = (where A is of order 3)	(p)	1
(B)	If $\|A\| = \frac{1}{8}$, then $\|\text{adj}(\text{adj}(2A))\|$ = (where A is of order 3)	(q)	4
(C)	If $(A+B)^2 = A^2 + B^2$, and $\|A\| = 2$ then $\|B\|$ = (where A and B are of odd order)	(r)	24
(D)	$\|A_{2\times 2}\| = 2$, $\|B_{3\times 3}\| = 3$ and $\|C_{4\times 4}\| = 4$, then $\|ABC\|$ is equal to	(s)	0

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2. For a matrix $M = \begin{bmatrix} \frac{3}{5} & \frac{4}{5} \\ x & \frac{3}{5} \end{bmatrix}$, If $M^{-1} = M^T$ then $x =$

A. $-\frac{3}{5}$

B. $-\frac{4}{5}$

C. $\frac{4}{5}$

D. $\frac{3}{5}$

Answer: B

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Comperhension Type

1. Two $n \times n$ square matrices A and B are said to be similar if there exists a non - singular matrix C such that C^{-1} AC = B .

If A and B are two singular matrices, then-

A. det(A) = det(B)

B. det(A) + det(B) = 0

C. det(AB) = 0

D. none of these

Answer: A

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2. Two $n \times n$ square matrices A and B are said to be similar if there exists a non - singular matrix C such that C^{-1} AC = B .

If A and B are similar matrices such that det(AB) = 0 then-

A. det(A)=0 and det(B) = 0'

B. det(A) = 0 or det (B) = 0

C. A = 0 and B = 0

D. A = 0 or B = 0 [0 =null matrix]

Answer: A

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3. Two $n \times n$ square matrices A and B are said to be similar if there exists a non - singular matrix C such that C^{-1} AC = B .

If A and B are similar matrices such that det(A) = 1, then -

A. det(B) = 1

B. det(A) + det(B) = 0

C. det(B) = -1

D. none of these

Answer: A

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4. A square matrix A is used to be an idempotent matrix if $A^2 = A$.

If A is a non-singular idempotent matrix, then-

A. A =I_n

B. A=0

C. A + A' =0

D. none of these

Answer: A

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5. A square matrix A is used to be an idempotent matrix if $A^2 = A$.

If A is an idempotent matrix and B = I -A, then-

A. AB = 0

B. BA $\neq$ 0

C. B^2 = I

D. $AB = I_n$

Answer: A

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6. A square matrix A is used to be an idempotent matrix if $A^2 = A$.

If A, B and A + B are idempotent matrices, then-

A. AB = BA = 0

B. AB = BA = I_n

C. AB = BA $\neq$ 0

D. AB = BA $\neq I_n$

Answer: A

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Assertion Reason Type

1. If A = $\begin{bmatrix} 3+2i & i \\ -i & 3-2i \end{bmatrix}$ then find A^{-1}

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2. If A is a 3×3 square matrix with $|A| = 5$ if $B = 4A^2$ then find $|B|$

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