MATHS

BOOKS - FULL MARKS MATHS (TAMIL ENGLISH)

APPLICATIONS OF MATRICES AND DETERMINANTS

Example

1. If $A=\begin{bmatrix}8 & -6 & 2 \\ -6 & 7 & -4 \\ 2 & -4 & 3\end{bmatrix}$ verify that $A(adjA)=(adjA)A=A|A|I_3$.

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2. Find the inverse of the matrix $\begin{bmatrix}2 & -1 & 3 \\ -5 & 3 & 1 \\ -3 & 2 & 3\end{bmatrix}$

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3. If A is a non - singular matrix of odd order, prove that |adj A| is positive.

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4. Find a matrix A if $adj(A) = \begin{bmatrix}7 & 7 & -7 \\ -1 & 11 & 7 \\ 11 & 5 & 7\end{bmatrix}$

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5. If adj A = $\begin{bmatrix}-1 & 2 & 2 \\ 1 & 1 & 2 \\ 2 & 2 & 1\end{bmatrix}$, find A^{-1}.

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6. If A is symmetric, prove that adj A is also symmetric.

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7. Verify the property $\left(A^T\right)^{-1}=\left(A^{-1}\right)^T$ with $A=\begin{bmatrix}2 & 9\\ 1 & 7\end{bmatrix}$

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8. Verify $(AB)^{-1}=B^{-1}A^{-1}$ with $A=\begin{bmatrix}0 & -3\\ 1 & 4\end{bmatrix}, B=\begin{bmatrix}-2 & -3\\ 0 & -1\end{bmatrix}$

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9. If $A = \begin{bmatrix} 4 & 3 \\ 2 & 5 \end{bmatrix}$, find x and y such that $A^2 + xA + yI_2 = O_2$. Hence, find A^{-1}.

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10. Prove that $\begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix}$ is orthogonal.

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11. If $A = \frac{1}{7}\begin{bmatrix} 6 & -3 & a \\ b & -2 & 6 \\ 2 & c & 3 \end{bmatrix}$ is orthogonal, find a, b and c and hence A^{-1}.

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12. Reduce the matrix $\begin{bmatrix} 3 & -1 & 2 \\ -6 & 2 & 4 \\ -3 & 1 & 2 \end{bmatrix}$ to a row-echelon form.

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13. Reduce the matrix $\begin{bmatrix} 0 & 3 & 1 & 6 \\ -1 & 0 & 2 & 5 \\ 4 & 2 & 0 & 0 \end{bmatrix}$ to a row-echelon form.

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14. Find the rank of each of the following matrices: (i) $\begin{bmatrix} 3 & 2 & 5 \\ 1 & 1 & 2 \\ 3 & 3 & 6 \end{bmatrix}$

(ii) $\begin{bmatrix} 4 & 3 & 1 & -2 \\ -3 & -1 & -2 & 4 \\ 6 & 7 & -1 & 2 \end{bmatrix}$

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15. Find the rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 4 \\ 3 & 0 & 5 \end{bmatrix}$ by reducing it to a row-echelon form.

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16. Show that the matrix $\begin{bmatrix} 3 & 1 & 4 \\ 2 & 0 & -1 \\ 5 & 2 & 1 \end{bmatrix}$ is non-singular and reduce it to the identiy matrix by elementary row transformations.

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17. Find the inverse of the non-singular matrix A = $\begin{bmatrix} 0 & 5 \\ -1 & 6 \end{bmatrix}$, by Gauss Jordan method.

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18. Find the inverse of $A = \begin{bmatrix} 2 & 1 & 1 \\ 3 & 2 & 1 \\ 2 & 1 & 2 \end{bmatrix}$ by Gauss - Jordan method.

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19. Solve the following system of linear equaltions, using matrix in inversion method: $5x + 2y = 3, 3x + 2y = 5.$

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Example Questions Solved

1. Solve, by Cramer's rule the system of equations $x_1 - x_2 = 3, 2x_1 + 3x_2 + 4x_3 = 17, x_2 + 2x_3 = 7.$

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2. In a T20 match, Chennai Super Kings needed just 6 runs to win with 1 ball left to go in the last over. The last ball was bowled and the batsman at the crease hit it high up. The ball traversed along a path in a vertical plane and the equation of the path is $y = ax^2 + bx + c$ with respect to a xy-coordinate system in the vertical plane and the ball traversed through the points (10,8), (20,16), (30,18) can you conclude that Chennai Super Kings won the match?

Justify your answer. (All distances are measured in metres and the meeting point of the plane of the path with the farthest boundary line is (70,0).

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3. Solve the following system of linear equaltions, by Gaussian elimination method:

$4x + 3y + 6z = 25, x + 5y + 7z = 13, 2x + 9y + z = 1.$

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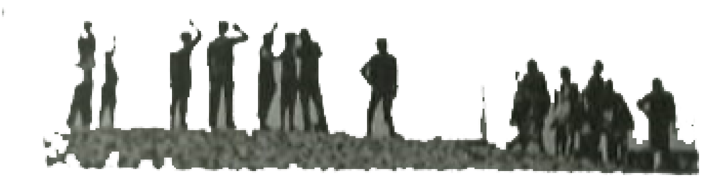
4. The upward speed v(t) of a rocket at time t is approximated by $v(t) = at^2 + bt + c, 0 \leq t \leq 100$ where a, b and c are constants. It has been found that the speed at times t=3, t=6 and t=9 seconds are respectively, 64, 133, and 208 miles per second respectively. Find the speed at time t=15 seconds. (Use Gaussian elimination method.)



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5. Test for consistency of the following system of linear equations and if possible solve:

$x - y + z = -9, 2x - 2y = -18, 3x - 3y + 3z + 27 = 0.$

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6. Find the condition on a, b and c so that the following system of linear equations has one parameter family of solutions:

$x + y + z = a, x + 2y + 3z = b, 3x + 5y + 7z = c.$

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7. Solve

$x + 2y + 3z = 0$

$3x + 4y + 4z = 0$

$7x + 10y + 12z = 0$

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8. Solve the system: $x+3y-2z=0, 2x-y+4z=0, x-11y+14z=0.$

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9. By using Gaussian elimination method, balance the chemical reaction equation:

$C_2H_6+O_2 \to H_2O+CO_2.$

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10. If the system of equtions $px+by+cz=0, ax+qy+cz=0, ax+by+rz=0$ has a non - trivial solution and $p \neq q, q \neq , r \neq c,$ prove that $\frac{p}{p-a}+\frac{q}{q-b}+\frac{r}{r-c}=2.$

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Exercise 1 1

1. Find the adjoint of the following :

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

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2. Find the inverse (if it exists) of the following:

(i) $\begin{bmatrix}-2 & 4 \\ 1 & -3\end{bmatrix}$ (ii) $\begin{bmatrix}5 & 1 & 1 \\ 1 & 5 & 1 \\ 1 & 1 & 5\end{bmatrix}$ (iii) $\begin{bmatrix}2 & 3 & 1 \\ 3 & 4 & 1 \\ 3 & 7 & 2\end{bmatrix}$

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3. If $F(\alpha) = \begin{bmatrix} \cos\alpha & 0 & \sin\alpha \\ 0 & 1 & 0 \\ -\sin\alpha & 0 & \cos\alpha \end{bmatrix}$, show that $\left[F(\alpha]^{-1} = F(-\alpha)\right.$.

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4. If $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$, show that $A^2 - 3A - 7I_2 = O_2$ Hence find A^{-1}.

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5. If $A = \frac{1}{9}\begin{bmatrix} -8 & 1 & 4 \\ 4 & 4 & 7 \\ 1 & -8 & 4 \end{bmatrix}$ prove that $A^{-1} = A^T$.

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6. If $A = \begin{bmatrix} 8 & -4 \\ -5 & 3 \end{bmatrix}$, verify that $A(adjA) = (adjA)A = |A|I_2$.

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7. If $A = \begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$, and $B = \begin{bmatrix} -1 & -3 \\ 5 & 2 \end{bmatrix}$ verify that $(AB)^{-1} = B^{-1}A^{-1}$.

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8. If adj (A) = $\begin{bmatrix} 2 & -4 & 2 \\ -3 & 12 & -7 \\ -2 & 0 & 2 \end{bmatrix}$, find A.

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9. If adj (A) = $\begin{bmatrix} 0 & -2 & 0 \\ 6 & 2 & -6 \\ -3 & 0 & 6 \end{bmatrix}$ find A^{-1}.

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10. Find adj (adj(A)) if adj A = $\begin{bmatrix} 1 & 0 & 1 \\ 0 & 2 & 0 \\ -1 & 0 & 1 \end{bmatrix}$.

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11. $A = \begin{bmatrix} 1 & \tan x \\ -\tan x & 1 \end{bmatrix}$, show that $A^T A^{-1} = \begin{bmatrix} \cos 2x & -\sin 2x \\ \sin 2x & \cos 2x \end{bmatrix}$.

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12. Find the matrix A for which $A \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix} = \begin{bmatrix} 14 & 7 \\ 7 & 7 \end{bmatrix}$.

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13. Given $A = \begin{bmatrix} 1 & -1 \\ 2 & 0 \end{bmatrix}$, $B = \begin{bmatrix} 3 & -2 \\ 1 & 1 \end{bmatrix}$ and $C\begin{bmatrix} 1 & 1 \\ 2 & 2 \end{bmatrix}$, find a matrix X such that AXB=C.

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14. If $A = \begin{bmatrix} 0 & 1 & 1 \\ 1 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$ show that $A^{-1} = \frac{1}{2}(A^2 = 3I)$

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15. Decrypt the received encoded message [2,-3][20,4] with the encryption matrix $\begin{bmatrix} -1 & -1 \\ 2 & 1 \end{bmatrix}$ and the decryption matrix as its inverse, where the system of codes are described by the numbers 1-26 to the letters A-Z respectively, and the number 0 to a blank space.

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Exercise 1 2

1. Find the rank of the following matrices by minor method:

(i) $\begin{bmatrix} 2 & -4 \\ -1 & 2 \end{bmatrix}$ (ii) $\begin{bmatrix} -1 & 3 \\ 4 & -7 \\ 3 & -4 \end{bmatrix}$ (iii) $\begin{bmatrix} 1 & -2 & -1 & 0 \\ 4 & -6 & -3 & 1 \end{bmatrix}$ (iv) $\begin{bmatrix} 1 & -2 & 3 \\ 2 & 4 & -6 \\ 5 & 1 & -1 \end{bmatrix}$ (v) $\begin{bmatrix} 0 & 1 & 2 & 1 \\ 0 & 2 & 4 & 3 \\ 8 & 1 & 0 & 2 \end{bmatrix}$

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2. Find the rank of the following matrices by row reduction method:

(i) $\begin{bmatrix} 1 & 1 & 1 & 3 \\ 2 & -1 & 3 & 4 \\ 5 & -1 & 7 & 11 \end{bmatrix}$ (ii) $\begin{bmatrix} 1 & 2 & -1 \\ 3 & -1 & 2 \\ 1 & -2 & 3 \\ 1 & -1 & 1 \end{bmatrix}$

(iii) $\begin{bmatrix} 3 & -8 & 5 & 2 \\ 2 & -5 & 1 & 4 \\ -1 & 2 & 3 & -2 \end{bmatrix}$

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3. Find the inverse of each of the following by Gauss - Jordan method :

$$\begin{bmatrix} 1 & 2 & 3 \\ 2 & 5 & 3 \\ 1 & 0 & 8 \end{bmatrix}$$

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Exercise 1 3

1. Solved the following system of linear equations by matrix inversion method.

$2x + 3y - z = 9, x + y + z = 9, 3x - y - z = -1$

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2. If A= $\begin{bmatrix} -5 & 1 & 3 \\ 7 & 1 & -5 \\ 1 & -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 & 2 \\ 3 & 2 & 1 \\ 2 & 1 & 3 \end{bmatrix}$, find the products AB and BA and hence solve the system of equations x+y+2z= 1,3x+2y+z=7, 2x+y+3z=2.

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3. A man is appointed in a job with a monthly salary of certain amount and a fixed amount of annual increment. If his salary was Rs 19,800 per month at the end of the first month after 3 years of service and Rs 23,400 per month at the end of the first month after 9 years of service find his starting salary and his annual increment. (Use matrix inversion method to solve the problem.)

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4. Four men and 4 women can finish a piece of work jointly in 3 days while 2 men and 5 women can finish the same work jointly in 4 days. Find the time taken by one man alone and that of one woman alone to finish the same work by using matrix inversion method.

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5. The prices of three commodities A,B and C are Rs x, y and z per unit respectively. A person P purchases 4 units of B and sells two units of A and 5 units of C. Person Q purchases 2 units of C and sells 3 units of A and one unit of B. Person R purchases one unit of A and sells 3 unit of B and one unit of C. In the process, PQ and R earn Rs 15,000, Rs 1,000 and Rs 4,000 respectively. Find the prices per unit of A,B and C. (Use matrix inversion method to solve the problem.)

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Exercise 1 4

1. Solve the following systems of linear equation by Cramer's rule:

$3x+3y-z=11$, $2x-y+2z=9$, $4x+3y+2z=25$

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2. In a competitive examination, one mark is awarded for every correct answer while $\frac{1}{4}$ mark is deducted for every wrong answer. A student answered 100 questions and got 80 marks. How many questions did he answer correctly ? (Use Cramer's rule to solve the problem).

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3. A chemist has one solution which is 50% acid and another solution which is 25 % acid. How much each should be mixed to make 10 litres of a 40 % acid solution ? (Use Cramer's rule to solve the problem).

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4. A fish tank can be filled in 10 minutes using both pumps A and B simultaneously. However, pump B can pump water in or out at the same rate. If pump B is inadvertently run in reverse, then the tank will be filled in 30 minutes. How long would it take each pump to fill the tank by itself ? (Use Cramer's rule to solve the problem).

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5. A family of 3 people went out for dinner in a restaurant. The cost of two dosai, three idlies and two vadais is Rs 150. The cost of the two dosai, two idlies and four vadais is Rs 200. The cost of five dosai, four idlies and two vadais is Rs 250. The family has Rs 350 in hand and they ate 3 dosai and six idlies and six vadais. Will they be able to manage to pay the bill within the amount they had?

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Exercise 1 5

1. Solve the following systems of linear equations by Gaussian elimination method.

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

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2. If ax^2+bx+c is divided by x+3,x-5, and x-1, the remainders are 21, 61 and 9 respectively. Find a,b, and c. (Use Gaussian elimination method.)

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3. An amount of Rs 65,000 is invested in three bonds at the rates of 6 % , 8% and 10% per annum respectively. The total annual income is Rs 4,800. The income from the third bond is Rs 600 more than that from the second bond. Determine the price of each bond. (Use Gaussian elimination method.)

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4. A boy is walking along the path $y = ax^2 + bx + c$ through the points (-6,8),(-2,-12), and (3,8). He wants to meet his friend at P(7,60).

Will he meet his friend? (Use Gaussian elimination method.)

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Exercise 1 6

1. Test for consistency and if possible solve the following system of equations by rank method.

x-y+2z=2,2x+y+4z=7,4x-y+z=4

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2. Find the value of k for which the equations kx-2y+z=1, x-2ky+z=-2,x-2y+kz=1 have

(i) no solution

(ii) unique solution

(iii) infinitely many solution

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3. In vestigate the values of λ and μ the system of linear equations

2x+3y+5z=9,7x+3y-5z=8, 2x+3y+λz=μ, have

(i) no solution

(ii) a unique solution

(iii) an infinite number of solutions.

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Exercise 1 7

1. Solve the following system of homogeneous equations.

3x+2y+7z=0,4x-3y-2z=0, 5x+9y+23z=0

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2. Determine the values of λ for which the following system of equations x+y+3z=0,4x+3y+λz=0, 2x+y+2z=0 has

(i) a unique solution

(ii) a non-trivial solution.

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3. By using Gaussian elimination method, balance the chemical reaction equation:

$C_2H_6 + O_2 \rightarrow H_2O + CO_2$.

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Exercise 1 8

1. If $|adj(adjA)| = |A|^9$ square matrix A is

A. 3

B. 4

C. 2

D. 5

Answer:

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2. If A is a 3×3 non -singular matrix such that $\mathrm{AA}^T = A^T A \text{and} B = A^{-1} A^T, \text{then} BB^T$ =

A. A

B. B

C. I_3

D. B^T

Answer:

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3. A= $\begin{bmatrix} 3 & 5 \\ 1 & 2 \end{bmatrix}$, B=adj A and C =3A, then $\frac{|adjB|}{|C|}$=

A. $\frac{1}{3}$

B. $\frac{1}{9}$

C. $\frac{1}{4}$

D. 1

Answer:

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4. If A $\begin{bmatrix} 1 & -2 \\ 1 & 4 \end{bmatrix} = \begin{bmatrix} 6 & 0 \\ 0 & 6 \end{bmatrix}$, then A=

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

B. $\begin{bmatrix} 1 & 2 \\ -1 & 4 \end{bmatrix}$

C. $\begin{bmatrix} 4 & 2 \\ -1 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 4 & -1 \\ 2 & 1 \end{bmatrix}$

Answer:

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5. If A = $\begin{bmatrix} 7 & 3 \\ 4 & 2 \end{bmatrix}$, then $9I_2 - A =$

A. A^{-1}

B. $\dfrac{A^{-1}}{2}$

C. $3A^{-1}$

D. $2A^{-1}$

Answer:

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6. If A = $\begin{bmatrix} 2 & 0 \\ 1 & 5 \end{bmatrix}$ $\text{and } B = \begin{bmatrix} 1 & 4 \\ 2 & 0 \end{bmatrix}$ then |adj(AB)|=

A. -40

B. -80

C. -60

D. -20

Answer:

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7. If P = $\begin{vmatrix} 1 & x & 0 \\ 1 & 3 & 0 \\ 2 & 4 & -2 \end{vmatrix}$ is the adjoint of 3×3 matrix A and |A|=4, then x is

A. 15

B. 12

C. 14

D. 11

Answer:

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8. If A = $\begin{bmatrix} 3 & 1 & -1 \\ 2 & -2 & 0 \\ 1 & 2 & -1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} a_{11} & a_{12} & a_{13} \\ a_{21} & a_{22} & a_{23} \\ a_{31} & a_{32} & a_{33} \end{bmatrix}$ then the value of a_{23} is

A. 0

B. -2

C. -3

D. -1

Answer:

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9. If A, B and C are invertible matrices of some order, then which one of the following is not true?

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

B. $adj(AB)=(adjA)(adjB)$

C. $\det A^{-1}=(\det A)^{-1}$

D. $(ABC)^{-1}=C^{-1}B^{-1}A^{-1}$

Answer:

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10. If $(AB)^{-1}=\begin{bmatrix}12&-17\\-19&27\end{bmatrix}\text{and}A^{-1}=\begin{bmatrix}1&-1\\-2&3\end{bmatrix}\text{then}\quad B^{-1}$=

A. $\begin{bmatrix}2&-5\\-3&8\end{bmatrix}$

B. $\begin{bmatrix}8&5\\3&2\end{bmatrix}$

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

D. $\begin{bmatrix}8&-5\\-3&2\end{bmatrix}$

Answer:

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11. If $A^T . A^{-1}$ is symmetric, then A^2=

A. A^{-1}

B. $(A^T)^2$

C. A^T

D. $(A^{-1})^2$

Answer:

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12. If A is a non-singular matrix such that $A^{-1} = \begin{bmatrix} 5 & 3 \\ -2 & -1 \end{bmatrix}$, then $(A^T)^{-1}$=

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

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

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

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

Answer:

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13. A = $\begin{bmatrix} \frac{3}{5} & \frac{4}{5} \\ x & \frac{3}{5} \end{bmatrix}$ and $A^T = A^{-1}$, then the value of x is

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

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

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

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

Answer:

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14. If A = $\begin{bmatrix} 1 & \tan\frac{\theta}{2} \\ -\tan\frac{\theta}{2} & 1 \end{bmatrix}$ and AB = I_2, then B=

A. $\left(\cos^2\frac{\theta}{2}\right)A$

B. $\left(\cos^2\frac{\theta}{2}\right)A^T$

C. $(\cos^2\theta)I$

D. $\left(\sin^2\frac{\theta}{2}\right)A$

Answer:

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15. $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ and A (adj A) = $\begin{bmatrix} k & 0 \\ 0 & k \end{bmatrix}$, then =k

A. 0

B. $\sin\theta$

C. $\cos\theta$

D. 1

Answer:

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16. If $A=\begin{bmatrix}2 & 3\\ 5 & -2\end{bmatrix}$ be such that $\lambda A^{-1}=A$, then λ is

A. 17

B. 14

C. 19

D. 21

Answer:

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17. If adj A = $\begin{bmatrix} 2 & 3 \\ 4 & -1 \end{bmatrix}$ and adj B = $\begin{bmatrix} 1 & -2 \\ -3 & 1 \end{bmatrix}$ then adj (AB) is

A. $\begin{bmatrix} -7 & -1 \\ 7 & -9 \end{bmatrix}$

B. $\begin{bmatrix} -6 & -5 \\ -2 & -10 \end{bmatrix}$

C. $\begin{bmatrix} -7 & 7 \\ -1 & -9 \end{bmatrix}$

D. $\begin{bmatrix} -6 & -2 \\ -5 & -10 \end{bmatrix}$

Answer:

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18. The rank of the matrix $\begin{bmatrix} 1 & 2 & 3 & 4 \\ 2 & 4 & 6 & 8 \\ -1 & -2 & -3 & -4 \end{bmatrix}$ is

A. 1

B. 2

C. 4

D. 3

Answer:

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19. If

$$x^a y^b = e^m, x^c y^d = e^n, \Delta_1 = \begin{bmatrix} m & b \\ n & d \end{bmatrix} \Delta_2 = \begin{bmatrix} a & m \\ c & n \end{bmatrix}, \Delta_3 = \begin{bmatrix} a & b \\ c & d \end{bmatrix}$$

then the value of x and y are respectively.

A. $e^{(\Delta_2 / \Delta_1)}, e^{\Delta_3 / \Delta_1}$

B. $\log(\Delta_1 / \Delta_3), \log(\Delta_2 / \Delta_3)$

C. $\log(\Delta_2 / \Delta_1), \log(\Delta_3 / \Delta_1)$

D. $e^{(\Delta_1 / \Delta_3)}, e^{(\Delta_2 / \Delta_3)}$

Answer:

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20. Which of the following is/are correct?

(i) Adjoint of a symmetric matrix is is also a symmetric matrix

(ii) Adjoint of a diagonal matrix is also a diagonal matrix.

(iii) If A is a square matrix of order n and λ is a scalar, then $adj(\lambda A) = \lambda^n adj(A)$.

(iv) $A(adjA) = (adjA)A = |A|I$

A. Only (i)

B. (ii) and (iii)

C. (iii) and (iv)

D. (i), (ii) and (iv)

Answer:

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21. If ρ (A) = ρ ([A|B]), then the system AX = B of linear equations is

A. consistent and has a unique solution

B. cosistent

C. consistent and has infinitely many solution

D. inconsistent

Answer:

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22. If $0 \leq \theta \leq \pi$ and the system of equations x+(sin $\theta)y - (\cos\theta)z = 0, (\cos\theta)x - y + z = 0, (\sin\theta)x + y - z = 0$ has a non -trivial solution then θ is

A. $\frac{2\pi}{3}$

B. $\frac{3\pi}{4}$

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

D. $\frac{\pi}{4}$

Answer:

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23. The augmented matrix of a system of linear equations is $\begin{bmatrix} 1 & 2 & 7 & 3 \\ 0 & 1 & 4 & 6 \\ 0 & 0 & \lambda - 7 & \mu + 5 \end{bmatrix}$. The system has infinitely many solutions if

A. $\lambda = 7, \mu \neq 5$

B. $\lambda = -7, \mu = 5$

C. $\lambda \neq 7, \mu \neq -5$

D. $\lambda = 7, \mu = -5$

Answer:

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24. Let A $=\begin{bmatrix}2 & -1 & 1\\ -1 & 2 & -1\\ 1 & -1 & 2\end{bmatrix}$ and $4B=\begin{bmatrix}3 & 1 & -1\\ 1 & 3 & x\\ -1 & 1 & 3\end{bmatrix}$.

If B is the inverse of A, then the value of x is

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

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

B. $\begin{bmatrix}6 & -6 & 8\\ 4 & -6 & 8\\ 0 & -2 & 2\end{bmatrix}$

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

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

Answer:

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Additional Questions Solved

1. Using elementary transformations find the inverse of the following matrix $\begin{bmatrix} 4 & 7 \\ 3 & 6 \end{bmatrix}$

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2. Using elementary transformations find the inverse of the matrix

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

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3. Using elementary transformation find the inverse of the matrix

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

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4. Using elementary transformations find the inverse of the matrix

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

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5. Using elementary transformation, find the inverse of the following matrix $\begin{bmatrix} 2 & 5 & 3 \\ 3 & 4 & 1 \\ 1 & 6 & 2 \end{bmatrix}$

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6. Given $A = \begin{bmatrix} 1 & -1 & 2 \\ 3 & 0 & -2 \\ 1 & 0 & 3 \end{bmatrix}$ verify that $A(adjA)_{=}(adjA)A = |A|I_3$.

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7. If A = $\begin{bmatrix} 3 & 2 \\ 7 & 5 \end{bmatrix}$ and B $= \begin{bmatrix} -1 & -3 \\ 5 & 2 \end{bmatrix}$ verify that $(AB)^{-1} = B^{-1}A^{-1}$.

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8. If $A = \begin{pmatrix} 3 & 1 \\ -1 & 2 \end{pmatrix}$ show that $A^2 - 5A + 7I_2 = 0$

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9. If $A=\begin{bmatrix}2&-1&1\\-1&2&-1\\1&-1&2\end{bmatrix}$ verify that $A^3-6A^2+9A-4I=0$

and hence find A^{-1}.

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10. Find the inverse of the matrices $\begin{bmatrix}1&-1&2\\0&2&-3\\3&-2&4\end{bmatrix}$

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11. Find the rank of the following matrices. $\begin{bmatrix}1&-1&1\\3&-2&3\\2&-3&4\end{bmatrix}$

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12. Find the rank of the following matrices. $\begin{bmatrix}0&1&2&1\\2&-3&0&-1\\1&1&-1&0\end{bmatrix}$

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13. Find the rank of the matrix $\begin{bmatrix} 1 & -2 & 3 & 4 \\ -2 & 4 & -1 & -3 \\ -1 & 2 & 7 & 6 \end{bmatrix}$

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14. Using elementary transformations find the inverse of the following matrix $\begin{bmatrix} 4 & 7 \\ 3 & 6 \end{bmatrix}$

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15. Using elementary transformations find the inverse of the following matrix $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$

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16. Using elementary transformations find the inverse of the following matrices $\begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}$

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17. Using elementary transformations find the inverse of the following matrices $\begin{bmatrix} 2 & -3 & 3 \\ 2 & 2 & 3 \\ 3 & -2 & 2 \end{bmatrix}$

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18. Using elementary transformations, find the inverse of the following matrices $\begin{bmatrix} 1 & 3 & 2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{bmatrix}$

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19. Using elementary transformations, find the inverse of the following matrices $\begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix}$

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20. Using elementary transformations, find the inverse of the following matrices $\begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix}$

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21. Using matrix method, solve the following system of equations:

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

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22. Using matrix matrices, solve the following system of linear equations:

$x+2y-3z=-4, +2x+3y+2z=2, 3x-3y-4z=11.$

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23. If $\begin{bmatrix}2 & -3 & 5 \\ 3 & 2 & -4 \\ 1 & 1 & -2\end{bmatrix}$, find A^{-1} Using A^{-1} solve the system of equations

$2x-3y+5z=11$

$3x+2y-4z=-5$

$x+y-2z=-3$

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24. Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations

$x - y + 2z = 1$

$2y - 3z = 1$

$3x - 2y + 4z = 2$

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25. Use product $\begin{bmatrix} 1 & -1 & 2 \\ 0 & 2 & -3 \\ 3 & -2 & 4 \end{bmatrix} \begin{bmatrix} -2 & 0 & 1 \\ 9 & 2 & -3 \\ 6 & 1 & -2 \end{bmatrix}$ to solve the system of equations

$x - y + 2z = 1$

$2y - 3z = 1$

$3x - 2y + 4z = 2$

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26. An amount of Rs 7000 is invested in three types of investments x,y and z the rate of 3%, 4%, and 5% interst respectively. The total annual income is Rs 280. If the combined income from x and y is Rs 80 more than that from z, then

(i) Represent the above situation in form of linear equations.

(ii) Is it possible to frame the given linear equations in the form of matrix to obtain the three values x, y and z using matrix multiplication? If yes, find. (iii) Which value is more beneficial to invest?

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27. If $A = \begin{pmatrix} 2 & 3 & 10 \\ 4 & -6 & 5 \\ 6 & 9 & -20 \end{pmatrix}$ find A^{-1}. Using A^{-1} solve the system of equations.

$$\frac{2}{x} + \frac{3}{y} + \frac{10}{z} = 2, \frac{4}{x} - \frac{6}{y} + \frac{5}{z} = 5, \frac{6}{x} + \frac{9}{y} + \frac{20}{z} = -4$$

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28. Solve the following non-homogeneous system of linear equations by determinat method: $3x+2y=5, x+3y=4.$

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29. Solve the following non-homogeneous system of linear equations by determinat method: $x+y+z=4, x-y+z=2, 2x+y-z=1$

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30. Solve :

$$\frac{1}{x}+\frac{2}{y}-\frac{1}{z}=1$$
$$\frac{2}{x}+\frac{4}{y}+\frac{1}{z}=5$$
$$\frac{3}{x}-\frac{2}{y}-\frac{2}{z}=0$$ Using Crammer's rule.

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31. Solve the following system of linear equaltions, by Gaussian elimination method:

$4x + 3y + 6z = 25, x + 5y + 7z = 13, 2x + 9y + z = 1.$

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32. Verify whether the given system is consistent. If it is consistent, solve them. $2x + 5y + 7z = 52, x + y + z = 9, 2x + y - z = 0$

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33. Examine the consistency of the equations.

$2x - 3y + 7z = 5, 3x + y - 3z = 13, 2x + 19y - 47z = 32$

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34. Show that the equations: $x+y+z=6, x+2y+3z=14, x+4y+7z=30$ are consistent and solve them.

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35. Discuss the solutions of the system of equations for all values of λ.

$x+y+z=2, 2x+y-2z=2, \lambda x+y+4z=2$

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36. For what values of k, the system of equations $kx+y+z=1, x+ky+z=1, x+y+kz=1$ have (i) unique solution (ii) more than one solution, (iii) no solution.

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37. Solve the following homogeneous linear equations.

$x+2y-5z=0, 3x+4y+6z=0, x+y+z=0$

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38. For what value of μ the equations.

$x+y+3z=0, 4x+3y+\mu z=0, 2x+y+2z=0$ have a (i) trivial solution (ii) non-trivial solution.

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

A. $m<n$

B. $m > n$

C. m=n

D. None of these

Answer:

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40. Matrices A and B will be inverse of each only if ....

A. AB=BA

B. AB=BA=O

C. AB=O, BA-I

D. AB=BA=I

Answer:

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41. If A is an invertible matrix of order 2 thaen det $(A)^{-1}$ is equal to

A. det (A)

B. $\frac{1}{\det(A)}$

C. 1

D. 0

Answer:

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42. Given $A=\begin{pmatrix}1 & -2\\ -5 & 7\end{pmatrix}$ then A (adj A) =..............

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

B. $\frac{1}{17}\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$

C. $\frac{1}{13}\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$

D. $\frac{1}{-3}\begin{pmatrix}1 & 0\\0 & 1\end{pmatrix}$

Answer:

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43. The inverse of $\begin{pmatrix}2 & 1\\4 & 2\end{pmatrix}$ is ....

A. $\frac{1}{2}\begin{pmatrix}2 & -1\\-4 & 2\end{pmatrix}$

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

C. $\begin{pmatrix}2 & 1\\4 & 2\end{pmatrix}$

D. Inverse dose not exist

Answer:

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44. Given $\rho(A, B) \neq \rho(A) <$ number of unknowns, then the system has. ....

A. unique solution

B. no solution

C. inconsistent

D. infinitely many solution

Answer:

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45. Given $\rho(A, B) \neq \rho(A) <$ number of unknowns, then the system has. ....

A. no solution

B. unique solution

C. infinitely many solution

D. None

Answer:

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46. Given $\rho(A, B) \neq \rho(A) <$ number of unknowns, then the system has. ....

A. unique solution

B. no solution

C. 3 sulutions

D. infinitely many solution

Answer:

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47. The rank of the matrix $\begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 3 & 6 & 9 \end{bmatrix}$ is ....

A. 1

B. 2

C. 3

D. None of these

Answer:

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48. If the rank of the matrix $\begin{pmatrix} 1 & 0 & -1 \\ 2 & 5 & \lambda \\ 3 & 6 & 9 \end{pmatrix}$ is 3, then the value of λ is ....

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49. If A = [2 0 1] then the rank of AA^T is ....

A. 1

B. 2

C. 3

D. 0

Answer:

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50. If the rank of the matrix $\begin{bmatrix} \lambda & -1 & 0 \\ 0 & \lambda & -1 \\ -1 & 0 & \lambda \end{bmatrix}$ is 2, then find λ.

A. 1

B. 2

C. 3

D. any real number

Answer:

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51. If A is a scalar matrix with scalar $k \neq 0$, of order 3, then A^{-1} is

....

A. $\frac{1}{k^2}I$

B. $\frac{1}{k^3}I$

C. $\frac{1}{k}I$

D. KI

Answer:

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52. If $A=\begin{bmatrix}2 & 1\\ 3 & 4\end{bmatrix}$, then (adjA)A..........

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53. If A is a square matrix of order n, then |adj A|=

A. $|A|^2$

B. $|A|^n$

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

D. $|A|$

Answer:

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54. If A is a matrix of order 3, then det (kA) ....

A. $k^3(\det A)$

B. $k^2(\det A)$

C. $k(\det A)$

D. det(A)

Answer:

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55. If I is the unit matrix of order n, where $k \neq 0$ is a constant, then adj(k)................

A. $k^n(adjI)$

B. $k(adjI)$

C. $k^2(adjI)$

D. $k^{n-1}(adjI)$

Answer:

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56. In a system of 3 linear non-homogeneous equations with three unknowns, if $\Delta = 0$ and $\Delta x = 0$, $\Delta y \neq 0$ and $\Delta z = 0$, then the system has ....

A. unique solution

B. two solution

C. infinitely many solution

D. no solutions

Answer:

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