



MATHS

BOOKS - SURA MATHS (TAMIL ENGLISH)

MATRICES AND DETERMINANTS

Exercise 7 1

1. Construct an $m \times n$ matrix $A = [a_{ij}]$, where a_{ij} is given by

$$a_{ij} = \frac{(i - 2j)^2}{2} \text{ with } m = 2, n = 3$$



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2. Construct an $m \times n$ matrix $A = [a_{ij}]$, where a_{ij} is given by

$$a_{ij} = \frac{|(3i - 4j)|}{4} \text{ with } m = 3, n = 4$$



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3. Find the values of p,q,r, and s if

$$\begin{bmatrix} p^2 - 1 & 0 & -31 - q^3 \\ 7 & r + 1 & 9 \\ -2 & 8 & s - 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & -4 \\ 7 & \frac{3}{2} & 9 \\ -2 & 8 & -\pi \end{bmatrix}$$



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4. Determine the value of $x+y$ if

$$\begin{bmatrix} 2x + y & 4x \\ 5x - 7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y - 13 \\ y & x + 6 \end{bmatrix}$$



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5. Determine the matrices A and B if they satisfy $2A - B + \begin{bmatrix} 6 & -6 & 0 \\ -4 & 2 & 1 \end{bmatrix} = 0$ and $A - 2B = \begin{bmatrix} 3 & 2 & 8 \\ -2 & 1 & -7 \end{bmatrix}$



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



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7. Consider the matrix $A_\alpha = \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$

Show that $A_\alpha A_\beta = A_{\alpha+\beta}$



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8. Consider the matrix $A_\alpha = \begin{bmatrix} \cos \alpha & -\sin \alpha \\ \sin \alpha & \cos \alpha \end{bmatrix}$

Find all possible real values of α satisfying the condition

$$A_\alpha + A_\alpha^T = I.$$



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9. If $A = \begin{bmatrix} 4 & 2 \\ -1 & x \end{bmatrix}$ and such that $(A-2I)(A-3I) = 0$, find the value of x .



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10. If $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ a & b & -1 \end{bmatrix}$, show that A^2 is a unit matrix.



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11. If $A = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix}$ and $A^3 - 6A^2 + 7A + kI = 0$,
find the value of k .



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12. Given your own examples of matrices satisfying the conditions in each case:

A and B such that $AB \neq BA$.



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13. Given your own examples of matrices satisfying the conditions in each case:

A and B such that $AB \neq BA$.



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14. Given your own examples of matrices satisfying the conditions in each case:

A and B such that $AB = 0$ and $BA \neq 0$.



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15. Show that $f(x)f(y) = f(x+y)$, where

$$f(x) = \begin{bmatrix} \cos x & -\sin x & 0 \\ \sin x & \cos x & 0 \\ 0 & 0 & 1 \end{bmatrix}.$$



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16. If A is a square matrix such that $A^2 = A$, find the value of $7A - (I + A)^3$.



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17. Verify the property $A(B+C) = AB+AC$, when the matrices A, B , and C are given by

$$A = \begin{bmatrix} 2 & 0 & -3 \\ 1 & 4 & 5 \end{bmatrix}, B = \begin{bmatrix} 3 & 1 \\ -1 & 0 \\ 4 & 2 \end{bmatrix}, \text{ and } C = \begin{bmatrix} 4 & 7 \\ 2 & 1 \\ 1 & -1 \end{bmatrix}$$

.



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18. Find the matrix A which satisfies the matrix relation A

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} = \begin{bmatrix} -7 & -8 & -9 \\ 2 & 4 & 6 \end{bmatrix}.$$



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19. If $A^T = \begin{bmatrix} 4 & 5 \\ -1 & 0 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 & 1 \\ 7 & 5 & -2 \end{bmatrix}$, verify

the

$$(A + B)^T = A^T + B^T = B^T + A^T$$



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20. If $A^T = \begin{bmatrix} 4 & 5 \\ -1 & 0 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 & 1 \\ 7 & 5 & -2 \end{bmatrix}$, verify
the

$$(A - B)^T = A^T - B^T$$



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21. If $A^T = \begin{bmatrix} 4 & 5 \\ -1 & 0 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 & 1 \\ 7 & 5 & -2 \end{bmatrix}$, verify
the

$$(B^T)^T = B.$$



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22. If A is a 3×4 matrix and B is a matrix such that both $A^T B$ and BA^T are defined, what is the order of the matrix B ?



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23. Express the matrices as the sum of a symmetric matrix and a skew-symmetric matrix:

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



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24. Express the matrices as the sum of a symmetric matrix and a skew-symmetric matrix:

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



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25. Find the matrix A such that

$$\begin{bmatrix} 2 & -1 \\ 1 & 0 \\ -3 & 4 \end{bmatrix} A = \begin{bmatrix} -1 & -8 & 10 \\ 1 & 2 & -5 \\ 9 & 22 & 15 \end{bmatrix}.$$



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26. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ x & 2 & y \end{bmatrix}$ is a matrix such that $AA^T = 9I$, find the values of x and y.



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27. For what value of x, the matrix $A = \begin{bmatrix} 0 & 1 & -2 \\ -1 & 0 & x^3 \\ 2 & -3 & 0 \end{bmatrix}$ is skew-symmetric .



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28. If $\begin{bmatrix} 0 & p & 3 \\ 2 & q^2 & -1 \\ r & 1 & 0 \end{bmatrix}$ is skew-symmetric, find the values of p, q, and r.



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29. Construct the matrix $A = [a_{ij}]_{3 \times 3}$, where $a_{ij} = i - j$. State whether A is symmetric or skew-symmetric.



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30. Let A and B be two symmetric matrices. Prove that $AB = BA$ if and only if AB is a symmetric matrix.



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31. If A and B are symmetric matrices of same order,
prove that

$AB+BA$ is a symmetric matrix.



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32. If A and B are symmetric matrices of same order,
prove that

$AB-BA$ is a skew-symmetric matrix.



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33. A shopkeeper in a Nuts and Spices shop makes gift packs of cashew nuts, raisins and almonds. Pack I contains 100 gm of cashew nuts, 100 gm of raisins and 50 gm of almonds. Pack-II contains 200 gm of cashew nuts, 100 gm Pack-III contains 250 gm of cashew nuts , 250 gm of raisins and and 150 gm of almonds. The cost of 50 gm of cashew nuts is Rs 50/-, 50 gm of raisins is Rs 10 /-, and 50 gm of almonds is Rs 60 /-. What is the cost of each gift pack ?



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Exercise 7 2

1. Without expanding the determinant , prove that

$$\begin{vmatrix} s & a^2 & b^2 + c^2 \\ s & b^2 & c^2 + a^2 \\ s & c^2 & a^2 + b^2 \end{vmatrix} = 0$$



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2. Show that $\begin{vmatrix} b+c & bc & b^2c^2 \\ c+a & ca & c^2a^2 \\ a+b & ab & a^2b^2 \end{vmatrix} = 0.$



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3. Prove that $\begin{vmatrix} a^2 & bc & ac + c^2 \\ a^2 + ab & b^2 & ac \\ ab & b^2 + bc & c^2 \end{vmatrix} = 4a^2b^2c^2.$



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4. Prove that

$$\begin{vmatrix} 1+a & 1 & 1 \\ 1 & 1+b & 1 \\ 1 & 1 & 1+c \end{vmatrix} = abc \left(1 + \frac{1}{a} + \frac{1}{b} + \frac{1}{c} \right).$$



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5. Prove that $\begin{vmatrix} \sec^2 \theta & \tan^2 \theta & 1 \\ \tan^2 \theta & \sec^2 \theta & -1 \\ 38 & 38 & 2 \end{vmatrix} = 0.$



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6. Show that $\begin{vmatrix} x+2a & y+2b & z+2c \\ x & y & z \\ a & b & c \end{vmatrix} = 0.$



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7. Write the general form of a 3×3 skew-symmetric matrix and prove that its determinant is 0.

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8. If $\begin{vmatrix} a & b & a\alpha + b \\ b & c & b\alpha + c \\ a\alpha + b & b\alpha + c & 0 \end{vmatrix} = 0$, prove that a,b,c, are in G.P. or α is a root of $ax^2 + 2bx+c=0$

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9. Prove that $\begin{vmatrix} 1 & a & a^2 - bc \\ 1 & b & b^2 - ca \\ 1 & c & c^2 - ab \end{vmatrix} = 0$.



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10. If a, b, c are p^{pt} , q^{th} and r^{th} terms of an A.P., find the

value of $\begin{vmatrix} a & b & c \\ p & q & r \\ 1 & 1 & 1 \end{vmatrix}$.



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11. Show that $\begin{vmatrix} a^2 + x^2 & ab & ac \\ ab & b^2 + x^2 & bc \\ ac & bc & c^2 + x^2 \end{vmatrix}$ is divisible by x^2 .



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12. If a, b, c are all positive, and are p^{th} , q^{th} and r^{th} terms

of a G.P., show that $\begin{vmatrix} \log a & p & 1 \\ \log b & q & 1 \\ \log c & r & 1 \end{vmatrix} = 0$.



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13. Find the value of $\begin{vmatrix} 1 & \log_x y & \log_x z \\ \log_y x & 1 & \log_y z \\ \log_z x & \log_z y & 1 \end{vmatrix}$ if $x, y, z \neq 1$



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14. If $A = \begin{bmatrix} \frac{1}{2} & \alpha \\ 0 & \frac{1}{2} \end{bmatrix}$, prove that

$$\sum_{k=1}^n \det(A^k) = \frac{1}{3} \left(1 - \frac{1}{4^n} \right).$$



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15. Without expanding, evaluate the determinants :

$$\begin{vmatrix} 2 & 3 & 4 \\ 5 & 6 & 8 \\ 6x & 9x & 12x \end{vmatrix}$$



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16. Without expanding evaluate the folleing determinents

(ii) $\begin{vmatrix} x + y & y + z & z + x \\ z & x & y \\ 1 & 1 & 1 \end{vmatrix}$



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17. If A is a square matrix and $|A|=2$, find the value of $|AA|^T$.



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18. If A and B are square matrices of order 3 such that $|A| = -1$ and $|B| = 3$, find the value of $|3AB|$.



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19. If $\lambda = -2$, determine the value of

$$\begin{vmatrix} 0 & 2\lambda & 1 \\ \lambda^2 & 0 & 3\lambda^2 + 1 \\ -1 & 6\lambda - 1 & 0 \end{vmatrix}.$$



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20. Determine the roots of the equation

$$\begin{vmatrix} 1 & 4 & 20 \\ 1 & -2 & 5 \\ 1 & 2x & 5x^2 \end{vmatrix} = 0.$$



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21. Verify that $\det(AB) = (\det A)(\det B)$ for

$$A = \begin{bmatrix} 4 & 3 & -2 \\ 1 & 0 & 7 \\ 2 & 3 & -5 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 3 & 3 \\ -2 & 4 & 0 \\ 9 & 7 & 5 \end{bmatrix}.$$



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22. Using cofactors of elements of second row, evaluate

$$|A|, \text{ where } A = \begin{bmatrix} 5 & 3 & 8 \\ 2 & 0 & 1 \\ 1 & 2 & 3 \end{bmatrix}$$



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Exercise 7 3

1. Solve the following problems by using Factor Theorem

:

Show that $\begin{vmatrix} x & a & a \\ a & x & a \\ a & a & x \end{vmatrix} = (x - a)^2(x + 2a)$.



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2. Show that

$$\begin{vmatrix} b+c & a-c & a-b \\ b-c & c+a & b-a \\ c-b & c-a & a+b \end{vmatrix} = 8abc$$



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3. Solve

$$\begin{vmatrix} x+a & b & c \\ a & x+b & c \\ a & b & x+c \end{vmatrix} = 0$$



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4. Solve

$$\begin{vmatrix} 4-x & 4+x & 4+x \\ 4+x & 4-x & 4+x \\ 4+x & 4+x & 4-x \end{vmatrix} = 0$$



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5. Show that $\begin{vmatrix} 1 & 1 & 1 \\ x & y & z \\ x^2 & y^2 & z^2 \end{vmatrix} = (x - y)(y - z)(z - x)$



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Exercise 7 4

1. Find the area of the triangle whose vertices are (0,0), (1,2) and (4,3).



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2. If (k,2),(2,4) and (3,2) are vertices of the triangle of area 4 square units then determine the value of k.



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3. Identify the singular and non-singular matrices:

$$\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$



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4. Identify the singular and non-singular matrices:

$$\begin{bmatrix} 2 & -3 & 5 \\ 6 & 0 & 4 \\ 1 & 5 & -7 \end{bmatrix}$$



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5. Identify the singular and non-singular matrices:

$$\begin{bmatrix} 0 & a - b & k \\ b - a & 0 & 5 \\ -k & -5 & 0 \end{bmatrix}$$



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6. Determine the values of a and b so that the following matrices are singular:

$$A = \begin{bmatrix} 7 & 3 \\ -2 & a \end{bmatrix}$$



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7. Determine the values of a and b so that the following matrices are singular:

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



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$$8. \text{ If } \cos 2\theta = 0, \text{ determine } \begin{vmatrix} 0 & \cos \theta & \sin \theta \\ \cos \theta & \sin \theta & 0 \\ \sin \theta & 0 & \cos \theta \end{vmatrix}^2$$



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9. Find the value of the product

$$\begin{vmatrix} \log_3 64 & \log_4 3 \\ \log_3 8 & \log_4 9 \end{vmatrix} \times \begin{vmatrix} \log_2 3 & \log_8 3 \\ \log_3 4 & \log_3 4 \end{vmatrix}$$



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Exercise 7 5

1. If $a_{ij} = \frac{1}{2}(3i - 2j)$ and $A = [a_{ij}]_{2 \times 2}$ is

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

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

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

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

Answer: A::B



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2. What must be the matrix X, if $2X + \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 3 & 8 \\ 7 & 2 \end{bmatrix}$?

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

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

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

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

Answer: A::B::C



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3. Which one of the following is true about the matrix

$$\begin{bmatrix} 1 & 0 & 0 \\ 0 & 0 & 0 \\ 0 & 0 & 5 \end{bmatrix} ?$$

A. a scalar matrix

B. a diagonal matrix

C. an upper triangular matrix

D. a lower triangular matrix

Answer: A::D



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4. Find which one is true.

If A and B are two matrices such that $A+B$ and BA are both defined then:

A. A and B are two matrices not necessarily of same
order

B. A and B are square matrices of same order

C. Number of columns of A is equal to the number of rows of B

D. $A = B$.

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



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5. If $A = \begin{bmatrix} \lambda & 1 \\ -1 & -\lambda \end{bmatrix}$, then for what value of λ , $A^2 = 0$?

A. 0

B. ± 1

C. -1

D. 1

Answer: A



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6. If $A = \begin{bmatrix} 1 & -1 \\ 2 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A + B)^2 = A^2 + B^2$, then the values of a and b are

A. $a = 4, b = 1$

B. $a = 1, b = 4$

C. $a = 0, b = 4$

D. $a = 2, b = 4$

Answer: A::B::D



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7. If $A = \begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ a & 2 & b \end{bmatrix}$ is a matrix satisfying the equation $AA^T = 9I$, where I is 3×3 identity matrix, then the ordered pair (a,b) is equal to

A. $(2, -1)$

B. $(-2, 1)$

C. $(2, 1)$

D. $(-2, -1)$

Answer: A::B



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8. If A is a square matrix, then which of the following is not symmetric ?

A. $A + A^T$

B. AA^T

C. $A^T A$

D. $A - A^T$

Answer: A



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9. If A and B are symmetric matrices of order n, where $(A \neq B)$, then:

A. A+B is skew-symmetric

B. A+B is symmetric

C. A+B is symmetric

D. A+B is a zero matrix

Answer: A::B::C



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10. If $A = \begin{bmatrix} a & x \\ y & a \end{bmatrix}$ and if $xy = 1$, then $\det(AA^T)$ is equal to

A. $(a - 1)^2$

B. $(a^2 + 1)^2$

C. $a^2 - 1$

D. $(a^2 - 1)^2$

Answer: A::B



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11. The value of x , for which the matrix $A = \begin{bmatrix} e^{x-2} & e^{7+x} \\ e^{2+x} & e^{2x+3} \end{bmatrix}$ is singular is

A. 9

B. 8

C. 7

D. 6

Answer:



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12. If the points $(x, -2)$, $(5, 2)$, $(8, 8)$ are collinear, then x is equal to

A. -3

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

C. 1

D. 3

Answer: D



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13. If $= \begin{vmatrix} 2a & x_1 & y_1 \\ 2b & x_2 & y_2 \\ 2c & x_3 & y_3 \end{vmatrix} = ab\frac{c}{2} \neq 0$ then the area of the triangle whose vertices are $\left(\frac{x_1}{a}, \frac{y_1}{a}\right), \left(\frac{x_2}{b}, \frac{y_2}{b}\right), \left(\frac{x_3}{c}, \frac{y_3}{c}\right)$ is:

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

B. $\frac{1}{4} abc$

C. $\frac{1}{8}$

D. $\frac{1}{8} abc$

Answer: A



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14. If the square of the matrix $\begin{bmatrix} \alpha & \beta \\ \gamma & -\alpha \end{bmatrix}$ is the unit matrix of order 2, then α , β and γ should satisfy the relation.

A. $1 + \alpha^2 + \beta\gamma = 0$

B. $1 - \alpha^2 - \beta\gamma = 0$

C. $1 - \alpha^2 + \beta\gamma = 0$

D. $1 + \alpha^2 - \beta\gamma = 0$

Answer: A::B



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15. If $\Delta = \begin{vmatrix} a & b & c \\ x & y & z \\ p & q & r \end{vmatrix}$, then $\begin{vmatrix} ka & kb & kc \\ kx & ky & kz \\ kp & kq & kr \end{vmatrix}$ is

- A. Δ
- B. $k\Delta$
- C. $3k\Delta$
- D. $k^3\Delta$

Answer: A::C::D



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16. A root of the equation $\begin{vmatrix} 3-x & -6 & 3 \\ -6 & 3-x & 3 \\ 3 & 3 & -6-x \end{vmatrix} = 0$ is

A. 6

B. 3

C. 0

D. -6

Answer:



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17. The value of the determinant of $A = \begin{bmatrix} 0 & a & -b \\ -a & 0 & c \\ b & -c & 0 \end{bmatrix}$

is

A. $-2abc$

B. abc

C. 0

D. $a^2 + b^2 + c^2$

Answer:



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18. If x_1, x_2, x_3 and y_1, y_2, y_3 are in arithmetic progression with the same common difference then the points $(x_1, y_1)(x_2, y_2)(x_3, y_3)$ are:

A. vertices of an equilateral triangle

B. vertices of a right angled triangle

C. vertices of a right angled isosceles

D. collinear

Answer: A::C



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19. If $\lfloor \cdot \rfloor$ denotes the greatest integer less than or equal to the real number under consideration and $-1 \leq x < 0, 0 \leq y < 1, 1 \leq z < 2$, then the value of

the determinant
$$\begin{vmatrix} \lfloor x \rfloor + 1 & \lfloor y \rfloor & \lfloor z \rfloor \\ \lfloor x \rfloor & \lfloor y \rfloor + 1 & \lfloor z \rfloor \\ \lfloor x \rfloor & \lfloor y \rfloor & \lfloor z \rfloor + 1 \end{vmatrix}$$
 is

A. $\lfloor z \rfloor$

B. $\lfloor y \rfloor$

C. $\lfloor x \rfloor$

D. $\lfloor x \rfloor + 1$

Answer:



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20. If $a \neq b$, b, c satisfy $\begin{vmatrix} a & 2b & 2c \\ 3 & b & c \\ 4 & a & b \end{vmatrix} = 0$, then $abc =$

A. $a+b+c$

B. 0

C. b^3

D. $ab+bc$

Answer: B::C



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21. If $A = \begin{vmatrix} -1 & 2 & 4 \\ 3 & 1 & 0 \\ -2 & 4 & 2 \end{vmatrix}$ and $B = \begin{vmatrix} -2 & 4 & 2 \\ 6 & 2 & 0 \\ -2 & 4 & 8 \end{vmatrix}$, then B is given by

A. $B = 4A$

B. $B = -4A$

C. $B = -A$

D. $B = 6A$

Answer: A::B::D



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22. If A is a skew symmetric matrix of order n and C is a column matrix of order $n \times 1$, then $C^T AC$ is

A. an identity matrix of order n

B. an identity matrix of order 1

C. a zero matrix of order 1

D. an identity matrix of order 2

Answer: A::D



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23. The matrix A satisfying the equation

$$\begin{bmatrix} 1 & 3 \\ 0 & 1 \end{bmatrix} A = \begin{bmatrix} 1 & 1 \\ 0 & -1 \end{bmatrix} \text{ is}$$

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

B. $\begin{bmatrix} 1 & -4 \\ 1 & 0 \end{bmatrix}$

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

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

Answer: A::D



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24. If $A + I = \begin{bmatrix} 3 & -2 \\ 4 & 1 \end{bmatrix}$, then $(A+I)(A-I)$ is equal to

A. $\begin{bmatrix} -5 & -4 \\ 8 & -9 \end{bmatrix}$

B. $\begin{bmatrix} -5 & 4 \\ -8 & 9 \end{bmatrix}$

C. $\begin{bmatrix} 5 & 4 \\ 8 & 9 \end{bmatrix}$

D. $\begin{bmatrix} -5 & -4 \\ -8 & -9 \end{bmatrix}$

Answer: D



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25. Let A and B be two symmetrices of same order. Then which one of the following statement is not true ?

A. A+B is a symmetric matrix

B. AB is a symmetric matrix

C. $AB = (BA)^T$

D. $A^T B = AB^T$

Answer: A::B::C



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Additional Problems Section A 1 Mark

1. If $\begin{bmatrix} 4 & 3 \\ -2 & x \end{bmatrix}$ is singular then the value of x is

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

B. $-\frac{3}{2}$

C. 3

D. -2

Answer: B::C



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2. If $\begin{pmatrix} 2 & \lambda & -3 \\ 0 & 2 & 5 \\ 1 & 1 & 3 \end{pmatrix}$ is a singular matrix, then λ is

A. $\lambda = 2$

B. $\lambda \neq 2$

C. $\lambda = \frac{-8}{5}$

D. $\lambda \neq \frac{-8}{5}$

Answer: A::B::D



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3. If $f(x) = \begin{vmatrix} 0 & x-a & x-b \\ x+a & 0 & x-c \\ x+b & x+c & 0 \end{vmatrix}$ then

A. $f(a)=0$

B. $f(b)=0$

C. $f(0)=0$

D. $f(1)=0$

Answer:



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4. Find the odd one out of the following :

- A. $\begin{bmatrix} 0 & 2 \\ -2 & 0 \end{bmatrix}$
- B. $\begin{bmatrix} 0 & \frac{-7}{2} \\ \frac{7}{2} & 0 \end{bmatrix}$
- C. $\begin{bmatrix} 0 & 3.2 \\ -3.2 & 0 \end{bmatrix}$
- D. $\begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$

Answer: A



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5. Choose the correct statement

- A. Matrix addition is not associative

B. Matrix addition is not commutative

C. Matrix multiplication is associative

D. Matrix multiplication is commutative

Answer: A::C



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6. Choose the incorrect statement

A. Matrix multiplication is non commutative

B. Matrix addition is associative

C. Singular matrices have inverse

D. Non singular matrices have inverse

Answer: A::C



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7. Assertion (A) : The inverse of $\begin{bmatrix} 2 & -1 \\ -4 & 2 \end{bmatrix}$ does not exist.

Reason (R) : The matrix is non-singular

A. Both A and R are true and R is the correct

explanation of A

B. Both A and R are true and R is not a correct

explanation of A

C. A is true but R is false

D. A is false but R is true

Answer: A::B



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Additional Problems Section B 2 Mark

1. Find x,y,z and w such that

$$\begin{bmatrix} x - y & 2z + w \\ 2x - y & 2x + w \end{bmatrix} = \begin{bmatrix} 5 & 3 \\ 12 & 15 \end{bmatrix}$$



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2. For what value of x the matrix $A = \begin{bmatrix} 1 & -2 & 3 \\ 1 & 2 & 1 \\ x & 2 & -3 \end{bmatrix}$ is singular.



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3. Without expanding evaluate the determinant

$$\begin{vmatrix} 41 & 1 & 5 \\ 79 & 7 & 9 \\ 29 & 5 & 3 \end{vmatrix}$$



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Additional Problems Section C 4 Mark

1. Find X and Y if $X+Y = \begin{bmatrix} 7 & 0 \\ 2 & 5 \end{bmatrix}$ and $X-Y = \begin{bmatrix} 3 & 0 \\ 0 & 3 \end{bmatrix}$.



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2. Find the non-zero values of x satisfying the matrix equation

$$x \begin{bmatrix} 2x & 2 \\ 3 & x \end{bmatrix}, 2 \begin{bmatrix} 8 & 5x \\ 4 & 4x \end{bmatrix} = 2 \begin{bmatrix} x^2 + 8 & 24 \\ 10 & 6x \end{bmatrix}$$



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3. If $A = \begin{bmatrix} \alpha & 0 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ 5 & 1 \end{bmatrix}$ find the values of α for which $A^2 = B$.



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4. Show that the points $(a,b+c)$ $(b,c+a)$ and $(c,a+b)$ are collinear.



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Additional Problems Section D 5 Mark

1. Using factor theorem, show that

$$\begin{vmatrix} -2a & a+b & c+a \\ a+b & -2a & b+c \\ c+a & c+b & -2c \end{vmatrix} = 4(a+b)(b+c)(c+a)$$



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2. Without expanding evaluate the determinant

$$\begin{vmatrix} \sin \alpha & \cos \alpha & \sin(\alpha + \delta) \\ \sin \beta & \cos \beta & \sin(\beta + \delta) \\ \sin \gamma & \cos \gamma & \sin(\gamma + \delta) \end{vmatrix}$$



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3. Show that $\begin{vmatrix} x & y & z \\ x^2 & y^2 & z^2 \\ x^3 & y^3 & z^3 \end{vmatrix} = xyz(x - y)(y - z)(z - x)$



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