MATHS

BOOKS - KUMAR PRAKASHAN KENDRA MATHS (GUJRATI ENGLISH)

Matrices

Exercise 3 1

1. In the matrix $\begin{bmatrix} 2 & 5 & 19 & -7 \\ 35 & -2 & \frac{5}{2} & 12 \\ \sqrt{3} & 1 & -5 & 17 \end{bmatrix}$, write :

(i) The order of the matrix ,

(ii) The number of elements,

(iii) Write the elements $a_{13}, a_{21}, a_{33}, a_{24}, a_{23}$,

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2. Construct $a2 \times 2$ matrix ,$A = [a_{ij}]$, whose elements are given by :

(i) $a_{ij} = \frac{(i+j)^2}{2}$,

(ii) $a_{ij} = \frac{i}{j}$

(iii) $a_{ij} = \frac{(i+2j)^2}{2}$

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3. Construct a 3×4 matrix , whose elements are given by :

(i) $a_{ij} = \frac{1}{2}|3i+j|$

(ii) $a_{ij} = 2i - j$

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4. Find the values of x, y and z from the following equations :

(i) $\begin{bmatrix} 4 & 3 \\ x & 5 \end{bmatrix} = \begin{bmatrix} y & z \\ 1 & 5 \end{bmatrix}$

(ii) $\begin{bmatrix} x+y & 2 \\ 5+z & xy \end{bmatrix} = \begin{bmatrix} 6 & 2 \\ 5 & 8 \end{bmatrix}$

(iii) $\begin{bmatrix} x+y+z \\ x+z \\ y+z \end{bmatrix} = \begin{bmatrix} 9 \\ 5 \\ 7 \end{bmatrix}$

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5. Find the value of a ,b,c and d from the equation :

$$\begin{bmatrix} a-b & 2a+c \\ 2a-b & 3c+d \end{bmatrix} = \begin{bmatrix} -1 & 5 \\ 0 & 13 \end{bmatrix}.$$

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6. 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: C

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7. Which of the given values of x and y make the following pair of matrices equal

$$\begin{bmatrix} 3x+7 & 5 \\ y+1 & 2-3x \end{bmatrix}, \begin{bmatrix} 0 & y-2 \\ 8 & 4 \end{bmatrix}.$$

A. $x = -\frac{1}{3}, y = 7$

B. Not possible to find

C. $y = 7, x = -\frac{2}{3}$

D. $x = -\frac{1}{3}, y = -\frac{2}{3}$

Answer: B

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8. The number of all possible matrices of order 3×3 with each entry 0 or 1 is :

A. 27

B. 18

C. 81

D. 512

Answer: D

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Exercise 3 2

1. Let $A = \begin{bmatrix} 2 & 4 \\ 3 & 2 \end{bmatrix}, B = \begin{bmatrix} 1 & 3 \\ -2 & 5 \end{bmatrix}, C = \begin{bmatrix} -2 & 5 \\ 3 & 4 \end{bmatrix}$

Find each of the following :

(i) A+B ,(i) A-B, (iii) 3A-C,

(iv) AB, (v)BA

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2. Compute the following :

(i) $\begin{bmatrix} a & b \\ -b & a \end{bmatrix} + \begin{bmatrix} a & b \\ b & a \end{bmatrix}$

(ii) $\begin{bmatrix} a^2+b^2 & b^2+c^2 \\ a^2+c^2 & a^2+b^2 \end{bmatrix} + \begin{bmatrix} 2ab & 2bc \\ -2ac & -2ab \end{bmatrix}$

(iii) $\begin{bmatrix} -1 & 4 & -6 \\ 8 & 5 & 16 \\ 2 & 8 & 5 \end{bmatrix} + \begin{bmatrix} 12 & 7 & 6 \\ 8 & 0 & 5 \\ 3 & 2 & 4 \end{bmatrix}$

(iv) $\begin{bmatrix} \cos^2 x & \sin^2 x \\ \sin^2 x & \cos^2 x \end{bmatrix} + \begin{bmatrix} \sin^2 x & \cos^2 x \\ \cos^2 x & \sin^2 x \end{bmatrix}$

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3. Compute the indicated products:

(i) $\begin{bmatrix} a & b \\ -b & a \end{bmatrix}\begin{bmatrix} a & -b \\ b & a \end{bmatrix}$

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

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

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

(v) $\begin{bmatrix} 2 & 1 \\ 3 & 2 \\ -1 & 1 \end{bmatrix}\begin{bmatrix} 1 & 0 & 1 \\ -1 & 2 & 1 \end{bmatrix}$

(vi) $\begin{bmatrix} 3 & -1 & 3 \\ -1 & 0 & 2 \end{bmatrix}\begin{bmatrix} 2 & -3 \\ 1 & 0 \\ 3 & 1 \end{bmatrix}$

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

then compute (A+B) and (B-C).Also , verify that A+(B-C) =(A+B)-C.

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5. If $A=\begin{bmatrix}\frac{2}{3} & 1 & \frac{5}{3}\\ \frac{1}{3} & \frac{2}{3} & \frac{4}{3}\\ \frac{7}{3} & 2 & \frac{2}{3}\end{bmatrix}$ and $B=\begin{bmatrix}\frac{2}{5} & \frac{3}{5} & 1\\ \frac{1}{5} & \frac{2}{5} & \frac{4}{5}\\ \frac{7}{5} & \frac{6}{5} & \frac{2}{5}\end{bmatrix}$,then compute 3A-5B.

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6. Simplify :

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

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7. Find X and Y,if

$$X+Y=\begin{bmatrix}5 & 2\\ 0 & 9\end{bmatrix} \text{ and } X-Y=\begin{bmatrix}3 & 6\\ 0 & -1\end{bmatrix}.$$

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8. Find X , if $Y=\begin{bmatrix}3 & 2\\ 1 & 4\end{bmatrix}$ and $2X+Y=\begin{bmatrix}1 & 0\\ -3 & 2\end{bmatrix}$.

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9. Find x and y, if $2\begin{bmatrix}1 & 3\\ 0 & x\end{bmatrix}+\begin{bmatrix}y & 0\\ 1 & 2\end{bmatrix}=\begin{bmatrix}5 & 6\\ 1 & 8\end{bmatrix}$.

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10. Solve the equation for x,y,z and t,if

$$2\begin{bmatrix}x & z\\ y & t\end{bmatrix}+3\begin{bmatrix}1 & -1\\ 0 & 2\end{bmatrix}=3\begin{bmatrix}3 & 5\\ 4 & 6\end{bmatrix}.$$

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11. If $x\begin{bmatrix}2\\3\end{bmatrix}+y\begin{bmatrix}-1\\1\end{bmatrix}=\begin{bmatrix}10\\5\end{bmatrix}$, find thevalues of x and y.

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12. Given $3\begin{bmatrix}x & y\\ z & w\end{bmatrix}=\begin{bmatrix}x & 6\\ -1 & 2w\end{bmatrix}+\begin{bmatrix}4 & x+y\\ z+w & 3\end{bmatrix}$, find the values of x,y,z and w.

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13. If $F(x)=\begin{bmatrix}\cos x & -\sin x & 0\\ \sin x & \cos x & 0\\ 0 & 0 & 1\end{bmatrix}$,show that $F(x)F(y)=F(x+y)$.

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14. Show that

(i) $\begin{bmatrix}5 & -1\\ 6 & 7\end{bmatrix}\begin{bmatrix}2 & 1\\ 3 & 4\end{bmatrix}\neq\begin{bmatrix}2 & 1\\ 3 & 4\end{bmatrix}\begin{bmatrix}5 & -1\\ 6 & 7\end{bmatrix}$

(ii) $\begin{bmatrix}1 & 2 & 3\\0 & 1 & 0\\1 & 1 & 0\end{bmatrix}\begin{bmatrix}-1 & 1 & 0\\0 & -1 & 1\\2 & 3 & 4\end{bmatrix} \neq \begin{bmatrix}-1 & 1 & 0\\0 & -1 & 1\\2 & 3 & 4\end{bmatrix}\begin{bmatrix}1 & 2 & 3\\0 & 1 & 0\\1 & 1 & 0\end{bmatrix}$

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15. Find $A^2 - 5A + 6I$, if $A = \begin{bmatrix}2 & 0 & 1\\2 & 1 & 3\\1 & -1 & 0\end{bmatrix}$.

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16. If $A = \begin{bmatrix}1 & 0 & 2\\0 & 2 & 1\\2 & 0 & 3\end{bmatrix}$ then , prove that

$A^3 - 6A^2 + 7A + 2I = O.$

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17. If $A = \begin{bmatrix}3 & -2\\4 & -2\end{bmatrix}$ and $I = \begin{bmatrix}1 & 0\\0 & 1\end{bmatrix}$, find k so that $A^2 = kA - 2I.$

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18. If $A = \begin{bmatrix} 0 & \tan\frac{\alpha}{2} \\ \tan\frac{\alpha}{2} & 0 \end{bmatrix}$ and I theidentity matrix of order 2, show that $I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$.

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19. A trust fund has Rs. 30,000 that must be invested in two different types of bonds . The first bond pays 5% interest per year ,and the second bond pays 7% interest per year .Using matrix multiplication , determine how to divide Rs. 30,000 among the two types of bonds . If the trust fund must obtain an annual total interest of : (a) Rs 1800 (b) Rs. 2000

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20. The bookshop of a particular school has 10 dozen chemistry books , 8 dozen physics books, 10 dozen economics books . Their selling prices are

Rs. 80, Rs, 60 and Rs.40 each respectively . Find the total amount the bookshop will receive from selling all the books using matrix algebra.

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21. Assume X, Y, Z, W and P Are Matrices of Order 2 x n, 3 x k, 2 x p, n x 3 and Respectively. The restriction on n , k and p so that PY +WY will be defined are :

(A) k=3,p=n

(B) k is arbitrary, p=2

(C) p is arbitrary, k=3

(D) k=2,p=3

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22. Assume X, Y, Z, W and P Are Matrices of Order 2 x n, 3 x k, 2 x p,N x 3 and Respectively. If n =p , then the order of the matrix 7X-5Z is :

(A) $p \times 2$

(B) $2 \times n$

(C) $n \times 3$

(D) $p \times n$

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Exercise 3 3

1. Find the transpose of each of the following matrices :

(i) $\begin{bmatrix} 5 \\ \frac{1}{2} \\ -1 \end{bmatrix}$

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

(iii) $\begin{bmatrix} -1 & 5 & 6 \\ \sqrt{3} & 5 & 6 \\ 2 & 3 & -1 \end{bmatrix}$

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2. If $A = \begin{bmatrix} -1 & 2 & 3 \\ 5 & 7 & 9 \\ -2 & 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} -4 & 1 & -5 \\ 1 & 2 & 0 \\ 1 & 3 & 1 \end{bmatrix}$, then verify that (i) (A+B)'=A'+B'

(ii) (A-B)'=A'-B'.

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3. If $A' = \begin{bmatrix} -2 & 3 \\ 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$ then find (A+2B)'.

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4. For the matrices A and B , verify that (AB)'= B'A', where

(i) $A = \begin{bmatrix} 1 \\ -4 \\ 3 \end{bmatrix}, B = [-1 \quad 2 \quad 1]$

(ii) $A = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}, B = [1 \quad 5 \quad 7]$

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5. If (i) $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ then verify that A'A=I.

(ii) $A = \begin{bmatrix} \sin\alpha & \cos\alpha \\ -\cos\alpha & \sin\alpha \end{bmatrix}$ then verify that A'A=I.

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6. Show that the matrix $A = \begin{bmatrix} 0 & 1 & -1 \\ -1 & 0 & 1 \\ 1 & -1 & 0 \end{bmatrix}$ is a skew symmetric matrix.

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7. For the matrix $A = \begin{bmatrix} 1 & 5 \\ 6 & 7 \end{bmatrix}$,verify that

(i) $(A + A)$ is a symmetric matrix.

(ii) (A-A) is a skew symmetric matrix.

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8. Find $\frac{1}{2}(A + A')$ and $\frac{1}{2}(A - A)$, when

$$A = \begin{bmatrix} 0 & a & b \\ -a & 0 & c \\ -b & -c & 0 \end{bmatrix}$$

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9. Express the following matrices as the sum of a symmetric and a skew symmetric matrix :

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

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10. If A and B are symmetric matrices of same order , then AB +BA is a .....

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11. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ and $A + A = I$,then the value of α is .....

(A) $\frac{\pi}{6}$

(B) $\frac{\pi}{3}$

(C) π

(D) $\frac{3\pi}{2}$

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Exercise 3 4

1. Using elementary row transformations , find the inverse of each of the matrices , if it exists in example number .

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

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2. Using elementary row transformations , find the inverse of $\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$

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3. Using elementary row transformations , find the inverse of $\begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$

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4. Using elementary row transformations , find the inverse of $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$

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5. Using elementary row transformations , find the inverse of $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$

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6. Using elementary row transformations , find the inverse of $\begin{bmatrix} 2 & 5 \\ 1 & 3 \end{bmatrix}$

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7. Using elementary row transformations , find the inverse of $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$

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8. Using elementary row transformations , find the inverse of $\begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$

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9. Using elementary row transformations , find the inverse of $\begin{bmatrix} 3 & 10 \\ 2 & 7 \end{bmatrix}$

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10. Using elementary row transformations , find the inverse of $\begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}$

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11. Using elementary row transformations , find the inverse of $\begin{bmatrix} 2 & -6 \\ 1 & -2 \end{bmatrix}$

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12. Using elementary row transformations , find the inverse of $\begin{bmatrix} 6 & -3 \\ -2 & 1 \end{bmatrix}$

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13. Using elementary row transformations , find the inverse of $\begin{bmatrix} 2 & -3 \\ -1 & 2 \end{bmatrix}$

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

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15. Using elementary transformations, find the inverse of the matrices

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

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16. Using elementary row transformations , find the inverse of

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

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17. Using elementary row transformations , find the inverse of

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

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18. Choose the correct answer in the example no . (18) so that statement becomes true .

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

A. AB=BA

B. AB =BA =O

C. AB =Q,BA=I

D. AB=BA=I

Answer: (D)

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Miscellaneous Exercise 3

1. Let A $A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$, show that $(aI + bA)^n = a^n I + na^{n-1} bA$, where I is the identity matrix of order 2 and $n \in N$.

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2. નીચેના આપેલા પ્રશ્ન નંબર 9 થી 14 ની માગ્યા મુજબ ગણતરી કરી જવાબ આપો (દરેકના 3 ગુણ છે.)

જો $A=\begin{bmatrix}1 & 1 & 1\\ 1 & 1 & 1\\ 1 & 1 & 1\end{bmatrix}$ હોય ,તો સાબિત કરો કે $A^n=\begin{bmatrix}3^{n-1} & 3^{n-1} & 3^{n-1}\\ 3^{n-1} & 3^{n-1} & 3^{n-1}\\ 3^{n-1} & 3^{n-1} & 3^{n-1}\end{bmatrix}, n \in N =$

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3. 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 positive integer .

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4. If A and B are symmetric matrices , prove that $AB-BA$ is a skew symmetric matrix.

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5. Show that the matrix B'AB is symmetric or skew symmetric according as A is symmetric or skew symmetric .

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6. Find the values of x,y,z if the matrix $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfy the equation A'A=I.

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7. For what values of x:

$$[1 \quad 2 \quad 3] \begin{bmatrix} 1 & 2 & 0 \\ 2 & 0 & 1 \\ 1 & 0 & 2 \end{bmatrix} \begin{bmatrix} 0 \\ 2 \\ x \end{bmatrix} = Q?$$

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8. If $A = \begin{bmatrix} 3 & 1 \\ -1 & 2 \end{bmatrix}$, show that $A^2 - 5A + 7I = O$.

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9. Find x , if $[x \ -5 \ -1] \begin{bmatrix} 1 & 0 & 2 \\ 0 & 2 & 1 \\ 2 & 0 & 3 \end{bmatrix} \begin{bmatrix} x \\ 4 \\ 1 \end{bmatrix} = O$.

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10. A manufacture produces three products x,y,z which he sells in two markets . Annual sales are indicated below :

Market	Products		
	x	y	z
I	10,000	2,000	18,000
II	6,000	20,000	8,000

(a) If unit sale prices of x,yand z are Rs. 2.50, Rs. 1.50 and Rs. 1.00 , respectively, find the total revenue in each market with the help of matrix algebra.

(b) If the unit costs of the above three commodities are Rs. 2.00, Rs. 1.00 and 50 paise repectively .Find the gross profit.

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11. Find the matrix X so that ,

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

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12. If A and B are square matrices of the same order such that AB=Ba , then prove by indication that $AB^n = B^nA$. Further , prove that $(AB)^n = A^nB^n$ for all $n \in N$.

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13. If $A = \begin{bmatrix}\alpha & \beta\\ \gamma & -\alpha\end{bmatrix}$ is such that $A^2 = I$, then .....

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: C

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14. If the matrix A is both symmetric and skew symmetric ,then .....

A. is a diagonal matrix

B. is a zero matrix

C. is a square matrix

D. None of these

Answer: B

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15. If A is square matrix such that $A^2 = A$, then $(I + A)^3 - 7A$ is equal to .....

A. A

B. I-A

C. I

D. 3A

Answer: C

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Practice Work

1. Construct 3×3 matrix $A = [a_{ij}]$ whose elements are given by $a_{ij} = 2i - 3j.$

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2. Construct a 3×4 matrix $A = [a_{ij}]$ whose elements are given by

$$a_{ij} = \begin{cases} 3i - 2j, \text{where} & i \neq j \\ 0, \text{where} & i = j \end{cases}$$

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3. Construct a 3×2 matrix $A = [a_{ij}]$, whose elements are given by

$$a_{ij} = \begin{cases} i - j, & i < j \\ i + j, & i = j \\ i \cdot j, & i > j \end{cases}.$$

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4. Obtain a $m \times n$ matrix $A = [a_{ij}]$. Such that $a_{ij} = 2i - j, m = 2, n = 4.$

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5. What is the order of the matrix

$$A = \begin{bmatrix} 1 & 1 & 9 & -11 \\ 2 & 3 & 8 & -15 \\ 3 & -7 & -12 & -6 \end{bmatrix}$$? Write the elements

$a_{12}, a_{21}, a_{24}, a_{31}, a_{34}$, of a matrix A.

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6. Find the value of x and y from the equation.

$$\begin{bmatrix} 3x+7 & 5 \\ y+1 & 2-3x \end{bmatrix} = \begin{bmatrix} -2 & 5 \\ 1 & 11 \end{bmatrix}$$

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7. Find the value of x, y,z and w from the equation.

$$\begin{bmatrix} x & 3x-y \\ 2x+z & 3y-w \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 4 & 7 \end{bmatrix}$$

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8. Find the value of x,y and z.

$$\begin{bmatrix} x+y+z \\ x+y \\ y+z \end{bmatrix} = \begin{bmatrix} 7 \\ 5 \\ 3 \end{bmatrix}$$

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9. Find the value of a,b,cand d.

$$\begin{bmatrix} a & 3a-b \\ 2a+c & 3b-d \end{bmatrix} = \begin{bmatrix} 3 & 2 \\ 7 & 7 \end{bmatrix}$$

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10. Find the value of a,b,c,x,y and z.

$$\begin{bmatrix} x+3 & z+4 & 2y-7 \\ 4x+6 & a-1 & 0 \\ b-3 & 3b & z+ac \end{bmatrix} = \begin{bmatrix} 0 & 6 & 3y+2 \\ 2x & -3 & 2c+2 \\ 2b+4 & -21 & 0 \end{bmatrix}$$

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11. Let $A = \begin{bmatrix} 2 & -1 \\ 4 & 2 \end{bmatrix} B = \begin{bmatrix} 4 & 3 \\ -2 & 1 \end{bmatrix}$ and $C = [(-2, -3), (-1, 2):]]$ Find the following (1) 2B+3C,(2)A+(B+C),(3)(2A-3B)-Cand4)(B+C)-2A.

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12. Compute the indicated products :

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

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

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

(4) $[1 \quad 2, \quad 3] \begin{bmatrix} 2 \\ 4 \\ 6 \end{bmatrix}$

(5) $\begin{bmatrix} 2 \\ 4 \\ 6 \end{bmatrix} [1 \quad 2, \quad 3]$

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13. If $A = \begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ then find AB. Also find BA if it exists ?

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14. $A = \begin{bmatrix} 1 & -2 & 3 \\ -4 & 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$ then find AB and BA . Show that $AB \neq BA$.

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15. Compute : $\begin{bmatrix} 1 & -1 \\ 0 & 2 \\ 2 & 3 \end{bmatrix} \left(\begin{bmatrix} 1 & 0 & 2 \\ 2 & 0 & 1 \end{bmatrix} - \begin{bmatrix} 0 & 1 & 3 \\ 1 & 0 & 2 \end{bmatrix} \right)$.

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16. Find X and Y,if

$$X+Y=\begin{bmatrix}5 & 2\\ 0 & 9\end{bmatrix} \text{ and } X-Y=\begin{bmatrix}3 & 6\\ 0 & -1\end{bmatrix}.$$

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17. If $A+B=\begin{bmatrix}4 & 3 & 2\\ 4 & 1 & 7\\ 3 & 2 & 0\end{bmatrix}$ and $A-B=\begin{bmatrix}6 & 1 & 4\\ -4 & 3 & 9\\ 5 & 8 & 2\end{bmatrix}$ Then find A and B.

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18. If $Y=\begin{bmatrix}4 & 3\\ 2 & 5\end{bmatrix}$ and $3X-Y=\begin{bmatrix}5 & 0\\ 1 & 1\end{bmatrix}$ then find X.

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19. If $f(x)=x^2-2x$ then find f(A) where $A=\begin{bmatrix}0 & 1 & 2\\ 4 & 5 & 0\\ 0 & 2 & 3\end{bmatrix}$.

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20. Solve : $\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} + 2\begin{bmatrix} 2x \\ 3y \end{bmatrix} = 3\begin{bmatrix} 7 \\ -3 \end{bmatrix}$.

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21. $A = \begin{bmatrix} 1 & 4 \\ 3 & 2 \\ 2 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 2 \\ 0 & 5 \\ 3 & 1 \end{bmatrix}$ then find the matrix X. where A+B-X=0.0 is a zero matrix.

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22. Find $A^2 - 5A + 6I$, if $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$.

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23. If $A = \begin{bmatrix} 1 & 0 \\ -1 & 7 \end{bmatrix}$ and $A^2 = 8A + KI$ then find K.

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24. Prove that , $\left\{\begin{bmatrix}1 & \omega & \omega^2\\ \omega & \omega^2 & 1\\ \omega^2 & 1 & \omega\end{bmatrix}+\begin{bmatrix}\omega & \omega^2 & 1\\ \omega^2 & 1 & \omega\\ \omega & \omega^2 & 1\end{bmatrix}\right\}\begin{bmatrix}1\\ \omega\\ \omega^2\end{bmatrix}=\begin{bmatrix}0\\ 0\\ 0\end{bmatrix}$

where ω is the cube root of unit.

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25. If $A=\begin{bmatrix}1 & \alpha\\ 0 & 1\end{bmatrix}$ then by the principle of mathematical induction . Prove that $A^n=\begin{bmatrix}1 & n\alpha\\ 0 & 1\end{bmatrix}$, $\forall n\in N$.

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26. If $A=\begin{bmatrix}0 & 1 & 2\\ 2 & -3 & 0\\ 1 & -1 & 0\end{bmatrix}$ and $f(x)=x^3+4x^2-x$, then find f(A).

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27. If $A = \begin{bmatrix} 2 & 3 & -4 \\ 5 & 1 & 0 \\ 3 & -2 & 5 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$ then show that AI=IA=A.

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28. Three friends Ram , Shyam and Rahul went to a shop .Ram purchased 12 dozen notebooks ,6 dozen pen and 10 dozen pencil . Shyam purchased 20 dozen notebooks , 10 dozen pen and 15 dozen pencils . If the price of 1 dozen notebooks , pen and pencil is respectively Rs 72, Rs. 48 and Rs. 18 . Using matrix equation find the amount paid by each person to shopkeepar .

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29. Two farmers Ramkishan and Gurpreet singh cultivates only three varieties of rice namely Basmati , perimal and Jirasar .The sales (in Rs.) of these varieties of rice by both the farmers in the months of September October are given by the following matrices A and B.

September			
	Basmati	Parimal	Jirasar
Ramkishan	10,000	20,000	30,000
Gurupreet Singh	50,000	30,000	10,000

October			
	Basmati	Parimal	Jirasar
Ramkishan	5,000	10,000	6,000
Gurupreet Singh	20,000	10,000	10,000

(i) Find the combined sales in September and October for each farmer in each variety.

(ii) In which month the selling is maximum.

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30. $A = \begin{bmatrix} 5 & -1 \\ 6 & 7 \end{bmatrix}, B = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 3 \\ -1 & 4 \end{bmatrix}$ then verify that

(i) (A)=A

(ii) (A+B)=A+B

(iii) (3A)'=3A

(iv) (AB)'=B'A'

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31. $A = \begin{bmatrix} 2 & 3 & -1 \\ 1 & -2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 2 & 5 \\ -1 & 3 \end{bmatrix}$ then verify that (AB) =B'A.

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32. If $A = \frac{1}{3}\begin{bmatrix} 1 & 2 & 2 \\ 2 & 1 & -2 \\ -2 & 2 & -1 \end{bmatrix}$ then show that A A'=A'A=I.

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33. If $A = \begin{bmatrix} 1 & 2 & 5 \\ 5 & 1 & 1 \\ 3 & 0 & 4 \end{bmatrix}$ then find A-2A'.

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34. For the matrices A and B, verify that (AB)'=B'A.

(i) $A = \begin{bmatrix} 1 \\ 3 \\ 6 \end{bmatrix}, B = [2 \quad 4, \quad 5]$

(ii) $A = \begin{bmatrix} 5 & 3 & -1 \\ 2 & 0 & 4 \end{bmatrix} B = \begin{bmatrix} -3 & 2 \\ 2 & 1 \\ -1 & 0 \end{bmatrix}$

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35. Express the matrix $B = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

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36. Show that all the diagonals elements of a skew symmetric matrix are zero .

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37. Prove that if A is a square matrix then ,(i) (A+A') is a symmetric metrix.

(ii) (A-A') is a skew symmetric matrix.

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38. Express the matrix $A = \begin{bmatrix} 2 & 3 & 4 \\ 5 & 6 & -2 \\ 1 & 4 & 5 \end{bmatrix}$ as the sum of a symmetric and

a skew symmetric matrix .

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39. If a matrix A is a symmetric matrix then show that A^n is also a

symmetric matrix . Where $n \in N$.

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40. Using elementary transformations find the inverse of each of the

following matrices , if it exist.

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

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41. Find the inverse of $\begin{bmatrix} 7 & 4 \\ 1 & -2 \end{bmatrix}$

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42. Find the inverse of each of the following matrices

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

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43. Find adjoint of each of the matrices

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

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44. Find inverse of $\begin{bmatrix} 1 & 2 & 1 \\ 3 & 2 & 3 \\ 1 & 1 & 2 \end{bmatrix}$

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45. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then prove that $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}, n \in N.$

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46. Find the matrix X such that ,

$$X\begin{bmatrix} 5 & -7 \\ -2 & 3 \end{bmatrix} = \begin{bmatrix} -16 & -6 \\ 7 & 2 \end{bmatrix}.$$

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47. Find the matrix X such that ,

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

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48. Find x, if $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = O.$

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49. Find the real numbers x and y so that $(xI + yA)^2 = A$, where $A = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$.

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50. For square matrices A and B , AB=A and BA =B, then prove that $A^2 = A$ and $B^2 = B.$

Watch Video Solution

51. If $A(\alpha)=\begin{bmatrix}\cos\alpha & \sin\alpha\\ -\sin\alpha & \cos\alpha\end{bmatrix}$ then prove that $A(\alpha)A(-\alpha)=I$.

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52. If $A=\begin{bmatrix}4 & x+2\\ 2x-3 & x+1\end{bmatrix}$ is symmetric matrix then find x.

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53. $A=\begin{bmatrix}a & b\\ 0 & 1\end{bmatrix}, a\neq 1$ then prove that $A^n=\begin{bmatrix}a^n & \frac{b(a^n-1)}{a-1}\\ 0 & 1\end{bmatrix}, n\in N.$

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54. $A=\begin{bmatrix}4 & 3\\ 2 & 5\end{bmatrix}, A^2-xA+yI=0$. Find real numbers x and y. where I is a 2×2 identity matrix.

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55. If $A = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ then prove that $(aI + bA)^3 = a^3 I + 3a^2 bA.$

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Textbook Based Mcqs

1. If $\begin{bmatrix} 3 & 1 & -1 \\ 0 & 1 & 2 \end{bmatrix}$ then AA ' is a ..... matrix.

A. Symmetric

B. Skew symmetric

C. Orthogonal

D. None of these

Answer: A

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2. If a matricx $\begin{bmatrix} 0 & 2\beta & \gamma \\ \alpha & \beta & -\gamma \\ \alpha & -\beta & \gamma \end{bmatrix}$ is a orthogonal matrix then .....

A. $\alpha = \pm \frac{1}{\sqrt{2}}$

B. $\beta = \pm \frac{1}{\sqrt{6}}$

C. $\gamma = \pm \frac{1}{\sqrt{3}}$

D. Given all

Answer: D

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

A. 4A

B. 3A

C. 2A

D. A

Answer: B

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4. If $A = \begin{bmatrix} 2 & -1 \\ 2 & 1 \end{bmatrix}, B = \begin{bmatrix} a & 1 \\ b & -1 \end{bmatrix}$ and $(A+B)^2 = A^2 + B^2 + 2AB$ then .....

A. $a = 2, b = -2$

B. $a = 2, b = 2$

C. $a = -2, b = 2$

D. $a = -2, b = -2$

Answer: D

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5. If $A = \begin{bmatrix} i & 0 \\ 0 & i \end{bmatrix}, n \in N$ then $A^{4n} =$ ..... (where I is imaginary complex number and $i^2 = -1$)

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

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

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

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

Answer: C

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6. $U = [2 \quad -3 \quad 4], V = \begin{bmatrix} 3 \\ 2 \\ 1 \end{bmatrix} X = [0 \quad 2 \quad 3]$ and $Y = \begin{bmatrix} 2 \\ 2 \\ 4 \end{bmatrix}$ then UV +XY=.....

A. 20

B. [-20]

C. -20

D. [20]

Answer: D

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7. If A is a square matrix then A - A' is a ..... matrix.

A. Skew symmetric

B. Symmetric

C. Diagonal

D. Orthogonal

Answer: A

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8. For matrices A and B, A +B and AB are difined then .....

A. A and B are any matrices

B. A and B are square matrices but not necessary having equal order

C. A and B are square matrices of some order

D. No. of coloumn in A=No. of row in B.

Answer: C

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9. If $A = [a \quad b], B = [-b \quad -a]$ and $C = \begin{bmatrix} a \\ -a \end{bmatrix}$ then out of the following ..... statement is true.

A. A=-B

B. A+B=A-B

C. AC =BC

D. CA =CB

Answer: C

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10. If $A(x) = \begin{bmatrix} \cos x & -\sin x \\ \sin x & \cos x \end{bmatrix}$ then $A\left(\frac{\pi}{2}\right).\ A(\pi)$= .....

A. A

B. $A\left(-\frac{\pi}{2}\right)$

C. $A\left(-\frac{3\pi}{2}\right)$

D. $A(-\pi)$

Answer: C

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11. If $A = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$ then A^{100} .....

A. 100 A

B. $2^{99}A$

C. $2^{100}A$

D. 99 A

Answer: B

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12. Matrix $\begin{bmatrix} 0 & 5 & -7 \\ -5 & 0 & 11 \\ 7 & -11 & 0 \end{bmatrix}$ is a ..... matrix.

A. Skew symmetric

B. Symmetric

C. Diagonal

D. Zero

Answer: A

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13. Out of the following which statement is false ?

A. All the diagonal elements of a symmetric matrix are zero.

B. All the diagonal elements of a skew symmetric matrix are zero .

C. For any square matrix A, $\frac{1}{2}(A + A')$ is a symmetric matrix.

D. For any square matrix A, $\frac{1}{2}(A - A')$ is a skew symmetric matrix.

Answer: A

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14. A matrix A has x rows and x+5 column . A matrix B has y rows and 11 -y column . A matrix B has y rows and 11 - y column . If AB and BA are exist then the value of x and y are respectively .....

A. 3,9

B. 8,3

C. 3,8

D. 4,8

Answer: C

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15. $P = \begin{bmatrix} \frac{2}{3} & 3k & a \\ -\frac{1}{3} & -4k & b \\ \frac{2}{3} & -5k & c \end{bmatrix}$ If $PP^T = I$ and $k = \frac{1}{\sqrt{50}}$ then the value of a,b,c are respectively .....

A. $\pm\frac{16}{5\sqrt{2}}, \pm\frac{13}{5\sqrt{2}}, \pm\frac{1}{3\sqrt{2}}$

B. $\pm\frac{1}{3\sqrt{2}}, \pm\frac{13}{5\sqrt{2}}, \pm\frac{16}{15\sqrt{2}}$

C. $\pm\frac{13}{15\sqrt{2}}, \pm\frac{16}{15\sqrt{2}}, \pm\frac{1}{3\sqrt{2}}$

D. None of these

Answer: C

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16. C is a skew symmetric matrix of order n. X is a column matrix of order $n \times 1$, then X'CX is a ..... matrix.

A. Square

B. Identity

C. Zero

D. None of these

Answer: C

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17. If $A^2 = A$ then $(I + A)^4 =$ .....

A. $I + A$

B. $I + 4A$

C. $I + 15A$

D. None of these

Answer: C

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18. If $AB = A$ and $BA = B$ then $A^2 + B^2 =$ .....

A. $A + B$

B. $-(A + B)$

C. $(2A + B)$

D. $(A + 2B)$

Answer: A

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19. If A is any square matrix then AA' is a ..... Matrix.

A. Symmetric

B. Skew symmetric

C. Identity

D. Diagonal

Answer: A

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20. If A and B are square matrices of same order then $\left(A^{-1}BA\right)^{n}$= ..... , $n \in N$.

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

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

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

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

Answer: C

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21. $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & a & 1 \end{bmatrix}$ and $A^{-1} = \begin{bmatrix} \frac{1}{2} & -\frac{1}{2} & \frac{1}{2} \\ -4 & 3 & c \\ \frac{5}{2} & -\frac{3}{2} & \frac{1}{2} \end{bmatrix}$ then

$a = \ldots\ldots$ and $c = \ldots\ldots\ldots$

A. 1,1

B. 1,-1

C. 1,2

D. $-1, 1$

Answer: B

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22. $\begin{bmatrix} \frac{1}{25} & 0 \\ x & \frac{1}{25} \end{bmatrix} = \begin{bmatrix} 5 & 0 \\ -a & 5 \end{bmatrix}^{-2}$ then x =.....

A. $\frac{a}{125}$

B. $\frac{2a}{25}$

C. $\frac{2a}{125}$

D. $\frac{2a}{25}$

Answer: C

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23. $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 0 & 5 & 1 \\ 0 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 1 \\ x \end{bmatrix} = 0$ then x=.....

A. 1

B. -1

C. $\frac{-9 \pm \sqrt{53}}{2}$

D. None of these

Answer: C

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24. A is a 3×4 matrix .A matrix B is such that A'B and BA' are defined . Then the order of B is .....

A. 3×4

B. 3×3

C. 4×4

D. 4×3

Answer: A

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25. P is a 2×2 matrix . $P' = P^{-1}$ then P=.....

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

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

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

D. None of these

Answer: B

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26. A is a 3×3 matrix , then $|3A| = \ldots. |A|$.

A. 3

B. 6

C. 9

D. 27

Answer: D

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27. If $A = [a_{ij}]_{n \times n}$ such that $a_{ij} = 0$, for $i \neq j$ then , A is ..... $(a_{ij} \neq a_{jj})(n > 1)$

A. a column matrix

B. a row matrix

C. a diagonal matrix

D. a scalar matrix.

Answer: C

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28. $A = \begin{bmatrix} 0 & 0 & -1 \\ 0 & -1 & 0 \\ -1 & 0 & 0 \end{bmatrix}$,the correct statement is .....

A. A^{-1} does not exist

B. $A = (-1)I_3$

C. $A^2 = I$

D. A is a diagonal matrix.

Answer: C

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29. If A is skew -symmetric 3×3 matrix , $|A|$ =.....

A. 1

B. 0

C. -1

D. 3

Answer: B

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30. The system of equations $ax + y + z = a - 1, x + ay + z = a - 1$ and $x + y + az = a - 1$ does not have unique solution if a = ...

A. 1 or -2

B. 3

C. 2

D. -1

Answer: A

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31. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} x & y \\ y & x \end{bmatrix}$ then , x=....., y=.....

A. $x = a^2 + b^2, y = a^2 - b^2$

B. $x = 2ab, y = a^2 + b^2$

C. $x = a^2 + b^2, y = ab$

D. $x = a^2 + b^2, y = 2ab$

Answer: D

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32. If α and β are not the multiple of $\frac{\pi}{2}$ and $\begin{bmatrix} \cos^2\alpha & \cos\alpha\sin\alpha \\ \cos\alpha\sin\alpha & \sin^2\alpha \end{bmatrix} \times \begin{bmatrix} \cos^2\beta & \sin\beta\cos\beta \\ \sin\beta\cos\beta & \sin^2\beta \end{bmatrix} = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$ then $\alpha - \beta$ is .....

A. any multiple of π

B. odd multiple of $\frac{\pi}{2}$

C. 0

D. odd multiple of π

Answer: B

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33. If $\begin{bmatrix} x & 0 \\ 1 & y \end{bmatrix} - \begin{bmatrix} 2 & -4 \\ -3 & -4 \end{bmatrix} = \begin{bmatrix} 3 & 5 \\ 6 & 3 \end{bmatrix} - \begin{bmatrix} 2 & 1 \\ 2 & 1 \end{bmatrix}$ then , x=...., y=.....

A. $x = 3, y = 2$

B. $x = 3, y = -2$

C. $x = -3, y = -2$

D. $x = -3, y = 2$

Answer: B

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34. If inverse of $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -3 \\ 1 & 1 & 1 \end{bmatrix}$ is $\frac{1}{10}\begin{bmatrix} 4 & 2 & 2 \\ -5 & 0 & \alpha \\ 1 & -2 & 3 \end{bmatrix}$ then α =.....

A. 5

B. -5

C. 2

D. -2

Answer: A

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35. If $AB = BA$ and $A = \begin{bmatrix} 1 & 1 \\ 0 & 1 \end{bmatrix}$ then, B=.....

A. $\begin{bmatrix} x & x \\ y & 0 \end{bmatrix}$

B. $\begin{bmatrix} x & y \\ 0 & x \end{bmatrix}$

C. $\begin{bmatrix} x & y \\ 0 & y \end{bmatrix}$

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

Answer: B

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36. If $A = \begin{bmatrix} 1 & 3 \\ 3 & 4 \end{bmatrix}$ and $A^2 = kA = 5I = O$,then k =....

A. 3

B. 7

C. 5

D. 9

Answer: C

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37. If $\begin{bmatrix}1 & x & 1\end{bmatrix}\begin{bmatrix}1 & 3 & 2\\ 0 & 5 & 1\\ 0 & 3 & 2\end{bmatrix}\begin{bmatrix}1\\ 1\\ x\end{bmatrix} = O$, then x=.....

A. $\frac{-9 \pm \sqrt{35}}{2}$

B. $\frac{-7 \pm \sqrt{53}}{2}$

C. $\frac{-9 \pm \sqrt{53}}{2}$

D. $\frac{-7 \pm \sqrt{35}}{2}$

Answer: C

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38. Matrix $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ if $AA^T = I$ then ,

$(x, y, z) = (..., ..., ...)(x, y, z > 0)$

A. $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{3}}, \frac{1}{\sqrt{6}}\right)$

B. $\left(\frac{1}{\sqrt{2}}, \frac{1}{\sqrt{6}}, \frac{1}{\sqrt{3}}\right)$

C. $\left(\frac{1}{\sqrt{3}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{6}}\right)$

D. $\left(\frac{1}{\sqrt{6}}, \frac{1}{\sqrt{2}}, \frac{1}{\sqrt{3}}\right)$

Answer: B

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

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

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

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

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

Answer: C

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40. If $A = \begin{bmatrix} \cos\frac{2\pi}{3} & -\sin\frac{2\pi}{3} \\ \sin\frac{2\pi}{3} & \cos\frac{2\pi}{3} \end{bmatrix}$ then , $A^3 =$ .....

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

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

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

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

Answer: B

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41. Check , whether , $\frac{1}{11}\begin{bmatrix} -1 & 8 & \alpha \\ 1 & -19 & 14 \\ 2 & 6 & -5 \end{bmatrix}$ is an inverse of $A = \begin{bmatrix} 1 & 2 & 5 \\ 3 & 1 & 1 \\ 4 & 2 & 1 \end{bmatrix}$, if so , that α=.....

A. -3

B. 2

C. `-5

D. does not exist

Answer: A

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42. If $A = \begin{bmatrix} 2x & 9 \\ -3 & -2 \end{bmatrix}$ and $|A| = 3$ then x = ..., $x \in R$

A. 7.5

B. 6

C. 15

D. 12

Answer: B

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43. For $A = [a_{ij}]_{n \times n}$ ' $a_{ij} = 0, i \neq j$ then is a .... matrix . $(a_{ii} \neq a_{ij}), (n > 1)$

A. Raw matrix

B. column matrix

C. Diagonal matrix

D. Scalar matrix

Answer: C

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Textbook Illustrations For Practice Work

1. Consider the following information regarding the number of men and women workers in three factories I,II and III :

	Men workers	Women workers
I	30	25
II	25	31
III	27	26

Represent the above information in the form of a3×2 matrix . What does the entry in the third row and second column represent ?

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2. If a matrix has 8 elements , what are the possible orders it can have ?

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3. Construct a 3×2 matrix whose elements are given by $a_{ij} = \frac{1}{2}|i - 3j|$.

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4. If $\begin{bmatrix} x+3 & z+4 & 2y-7 \\ -6 & a-1 & 0 \\ b-3 & -21 & 0 \end{bmatrix} = \begin{bmatrix} 0 & 6 & 3y-2 \\ -6 & -3 & 2c+2 \\ 2b+4 & -21 & 0 \end{bmatrix}$

Find the values of a,b,c,x,y and z.

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5. Find the values of a,b,c,and d from the following equation :

$$\begin{bmatrix} 2a+b & a-2b \\ 5c-d & 4c+3d \end{bmatrix} = \begin{bmatrix} 4 & -3 \\ 11 & 24 \end{bmatrix}$$

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6. Given $A = \begin{bmatrix} \sqrt{3} & 1 & -1 \\ 2 & 3 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & \sqrt{5} & 1 \\ -2 & 3 & \frac{1}{2} \end{bmatrix}$ find A+B.

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7. If $A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & -1 & 3 \\ -1 & 0 & 2 \end{bmatrix}$, then find $2A - B$.

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8. If $A = \begin{bmatrix} 8 & 0 \\ 4 & -2 \\ 3 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -2 \\ 4 & 2 \\ -5 & 1 \end{bmatrix}$, then find the matrix X , such that 2A+3X=5B.

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9. Find X and Y,if

$X + Y = \begin{bmatrix} 5 & 2 \\ 0 & 9 \end{bmatrix}$ and $X - Y = \begin{bmatrix} 3 & 6 \\ 0 & -1 \end{bmatrix}$.

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10. Find the values of x and y from the following equation , $2\begin{bmatrix} x & 5 \\ 7 & y-3 \end{bmatrix} + \begin{bmatrix} 3 & -4 \\ 1 & 2 \end{bmatrix} = \begin{bmatrix} 7 & 6 \\ 15 & 14 \end{bmatrix}$.

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11. Two farmers Ramkishan and Gurpreet singh cultivates only three varieties of rice namely Basmati , perimal and Jirasar .The sales (in Rs.) of these varieties of rice by both the farmers in the months of September October are given by the following matrices A and B.

September			
	Basmati	Parimal	Jirasar
Ramkishan	10,000	20,000	30,000
Gurupreet Singh	50,000	30,000	10,000

October			
	Basmati	Parimal	Jirasar
Ramkishan	5,000	10,000	6,000
Gurupreet Singh	20,000	10,000	10,000

(i) Find the combined sales in September and October for each farmer in each variety.

(ii) In which month the selling is maximum.

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12. Find AB, if $A = \begin{bmatrix} 6 & 9 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 6 & 0 \\ 7 & 9 & 8 \end{bmatrix}$.

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

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14. If $A = \begin{bmatrix} 1 & 0 \\ 0 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then $AB = \begin{bmatrix} 0 & 1 \\ -1 & 0 \end{bmatrix}$. and $BA = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$. Clearly $AB \neq BA$.

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15. Find AB, if $A = \begin{bmatrix} 0 & -1 \\ 0 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 5 \\ 0 & 0 \end{bmatrix}$.

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16. If $A=\begin{bmatrix}1 & 1 & -1\\ 2 & 0 & 3\\ 3 & -1 & 2\end{bmatrix}, B=\begin{bmatrix}1 & 3\\ 0 & 2\\ -1 & 4\end{bmatrix}$ and $C=\begin{bmatrix}1 & 2 & 3 & -4\\ 2 & 0 & -2 & 1\end{bmatrix}$,

find A(BC) , (AB)C and show that (AB) C=A(BC),

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17. If $A=\begin{bmatrix}0 & 6 & 7\\ -6 & 0 & 8\\ 7 & -8 & 0\end{bmatrix}, B=\begin{bmatrix}0 & 1 & 1\\ 1 & 0 & 2\\ 1 & 2 & 0\end{bmatrix}, C=\begin{bmatrix}2\\ -2\\ 3\end{bmatrix}$.

Calculate AC, BC and (A+B)C. Also , verify that (A+B)C=AC+BC.

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18. If $A=\begin{bmatrix}1 & 2 & 3\\ 3 & -2 & 1\\ 4 & 2 & 1\end{bmatrix}$, then show that

$A^3-23A-40I=O.$

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19. In a legislative assembly election , a political group hired a public relations form to promote its candidate in three ways , telephone , house calls , and letters . The cost per contect (in paise) Cost per contact

$$A = \begin{bmatrix} 40 \\ 100 \\ 50 \end{bmatrix} \begin{matrix} \text{Telephone} \\ \text{Housecall} \\ \text{Letter} \end{matrix}$$

The number of contacts of each type made in two cities X and Y is given by

$$\text{B=} \begin{bmatrix} \text{Telephone} & \text{Housecall} & \text{Letter} \\ 1000 & 500 & 5000 \\ 3000 & 1000 & 10{,}000 \end{bmatrix} \begin{matrix} \\ \to X \\ \to Y \end{matrix}$$

Find the total amount spent by the group in the two cities X and Y.

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20. If $A = \begin{bmatrix} 3 & \sqrt{3} & 2 \\ 4 & 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$ verify that (i) (A')'=A

(ii) (A+B)' =A'+B'

(iii) (kB)'=kB ', where k is any constant.

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21. If $A = \begin{bmatrix} -2 \\ 4 \\ 5 \end{bmatrix}$, $B = [1 \quad 3 \quad -6]$, verify that (AB)'=B'A'.

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22. Express the matrix $B = \begin{bmatrix} 2 & -2 & -4 \\ -1 & 3 & 4 \\ 1 & -2 & -3 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

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23. By using elementary operations , find the inverse of the matrix $A = \begin{bmatrix} 1 & 2 \\ 2 & -1 \end{bmatrix}$

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24. Obtain the inverse of the following matrix using elementary operations $A = \begin{bmatrix} 0 & 1 & 2 \\ 1 & 2 & 3 \\ 3 & 1 & 1 \end{bmatrix}$

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25. Find P^{-1}, if it exists given $P = \begin{bmatrix} 10 & -2 \\ -5 & 1 \end{bmatrix}$.

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26. If $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$ then prove that $A^n = \begin{bmatrix} \cos n\theta & \sin n\theta \\ -\sin n\theta & \cos n\theta \end{bmatrix}, n \in N.$

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27. If A and B are symmetric matrices of the same order , then show that AB is symmetric if and only if A and B commute , that is AB=BA.

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28. Let $A = \begin{bmatrix} 2 & -1 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} 5 & 2 \\ 7 & 4 \end{bmatrix}, C = \begin{bmatrix} 2 & 5 \\ 3 & 8 \end{bmatrix}.$

Find a matrix D such that CD-AB=O

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Solutions Of Ncert Exemplar Problems Short Answer Type Questions

1. If a matrix has 28 elements , what are the possible orders it can have ?

What if it has 13 elements ?

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2. In the matrix $A = \begin{bmatrix} a & 1 & x \\ 2 & \sqrt{3} & x^2 - y \\ 0 & 5 & -\frac{2}{5} \end{bmatrix}$, write :

(i) The order of the matrix A

(ii) The number of elements

(iii) Write elements a_{23}, a_{31}, a_{12}

Watch Video Solution

3. Construct $a_{2\times 2}$ matrix where

(i) $a_{ij} = \frac{(i-2j)^2}{2}$

(ii) $a_{ij} = |-2i+3j|$

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4. Construct $a3 \times 2$ matrix whose elements are given by $a_{ij} = e^{ix}.\sin(jx)$.

Watch Video Solution

5. Find values of a and b if A =B where $A = \begin{bmatrix} a+4 & 3b \\ 8 & -6 \end{bmatrix}, B = \begin{bmatrix} 2a+2 & b^2+2 \\ 8 & b^2-5b \end{bmatrix}$ Hints for solution : In

given two square matrix if corresponding elements of each raw and column are equal then both matrix are said to be equal matrix.

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6. If possible , find the sum of the matrices A and B , where $A = \begin{bmatrix} \sqrt{3} & 1 \\ 2 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} x & y & z \\ a & b & c \end{bmatrix}$.

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7. If $X = \begin{bmatrix} 3 & 1 & -1 \\ 5 & -2 & -3 \end{bmatrix}$ and $Y = \begin{bmatrix} 2 & 1 & -1 \\ 7 & 2 & 4 \end{bmatrix}$, find

(i) X+Y

(ii) 2X-3Y

(iii) A matrix Z such that X+Y +Z is a zero matrix.

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

$$x \cdot \begin{bmatrix} 2x & 2 \\ 3 & x \end{bmatrix} + 2\begin{bmatrix} 8 & 5x \\ 4 & 4x \end{bmatrix} = 2\begin{bmatrix} x^2+8 & 24 \\ 10 & 6x \end{bmatrix} \text{ where } x \neq 0.$$

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9. If $A = \begin{bmatrix} 0 & 1 \\ 1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 0 & -1 \\ 1 & 0 \end{bmatrix}$ show that $(A+B)\cdot(A-B) \neq A^2 - B^2$.

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10. Find x, if $\begin{bmatrix} 1 & x & 1 \end{bmatrix}\begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = O.$

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11. Show that $A = \begin{bmatrix} 5 & 3 \\ -1 & -2 \end{bmatrix}$ satisfies the equation $A^2 = 3A - 7I = 0$ and hence find A^{-1}.

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12. Find the matrix A satisfying the matrix equation :

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

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13. Find A , if $\begin{bmatrix} 4 \\ 1 \\ 3 \end{bmatrix} A = \begin{bmatrix} -4 & 8 & 4 \\ -1 & 2 & 1 \\ -3 & 6 & 3 \end{bmatrix}$

Watch Video Solution

14. If $A = \begin{bmatrix} 3 & -4 \\ 1 & 1 \\ 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$,then verify $(B \cdot A)^2 \neq B^2 \cdot A^2$.

Watch Video Solution

15. If possible , find BA and AB , where

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

Watch Video Solution

16. Show by an example that for $A \neq O, B \neq O, AB = O$.

Watch Video Solution

17. Given $A = \begin{bmatrix} 2 & 4 & 0 \\ 3 & 9 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 4 \\ 2 & 8 \\ 1 & 3 \end{bmatrix}$. Is (AB)'=B'A?

Watch Video Solution

18. Solve for x and y :

$$x\begin{bmatrix} 2 \\ 1 \end{bmatrix} + y\begin{bmatrix} 3 \\ 5 \end{bmatrix} + \begin{bmatrix} -8 \\ -11 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

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19. If X and Y are 2×2 matrices , then solve the following matrix equations for X and Y

$$2X + 3Y = \begin{bmatrix} 2 & 3 \\ 4 & 0 \end{bmatrix}, 3X + 2Y = \begin{bmatrix} -2 & 2 \\ 1 & -5 \end{bmatrix}$$

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20. If $A = [3 \quad 5], B = [7 \quad 3]$, then find a non - zero matrix C such that AC=BC.

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21. Give an example of matrices A,B and C such that AB=AC, where A is nonzero matrix , but $B \neq C$.

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22. If $A = \begin{bmatrix} 1 & 2 \\ -2 & 1 \end{bmatrix}, B = \begin{bmatrix} 2 & 3 \\ 3 & -4 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 0 \\ -1 & 0 \end{bmatrix}$ verify

(i) $(A \cdot B) \cdot C = A \cdot (BC)$

(ii) $A \cdot (B + C) = AB + AC$

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23. If $P = \begin{bmatrix} x & 0 & 0 \\ 0 & y & 0 \\ 0 & 0 & z \end{bmatrix}$ and $Q = \begin{bmatrix} a & 0 & 0 \\ 0 & b & 0 \\ 0 & 0 & c \end{bmatrix}$, prove that $PQ = \begin{bmatrix} xa & 0 & 0 \\ 0 & yb & 0 \\ 0 & 0 & zc \end{bmatrix} = QP.$

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24. If $\begin{bmatrix} 2 & 1 & 3 \end{bmatrix} \begin{bmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix} = A$ find A.

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25. If $A = [2 \quad 1], B = \begin{bmatrix} 5 & 3 & 4 \\ 8 & 7 & 6 \end{bmatrix}$ and $C = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 0 & 2 \end{bmatrix}$, verify $A \cdot (B + C) = AB + AC.$

Watch Video Solution

26. If $A = \begin{bmatrix} 1 & 0 & -1 \\ 2 & 1 & 3 \\ 0 & 1 & 1 \end{bmatrix}$, then verify that $A^2 + A = A(A + I) where I is 3xx3$` unit matrix.

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27. If $A = \begin{bmatrix} 0 & -1 & 2 \\ 4 & 3 & -4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 0 \\ 1 & 3 \\ 2 & 6 \end{bmatrix}$ then verify that :

(i) $(A') = A$

(ii) $(A \cdot B)' = B' \cdot A'$

(iii) $(kA)' = (k \cdot A')$

Watch Video Solution

28. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 1 \\ 5 & 6 \end{bmatrix}, B = \begin{bmatrix} 1 & 2 \\ 6 & 4 \\ 7 & 3 \end{bmatrix}$, then verify that :

(i) $(2A + B) = 2A' + B'$

(ii) $(A - B)' = A' - B'$

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29. Show that A'A and A A ' are both symmetric matrices for any matrix A .

Watch Video Solution

30. Let A and B be square matrices of the order 3×3 . Is $(AB)^2 = A^2B^2$? Given reasons .

Watch Video Solution

31. Show that if A and B are square matrics such that AB=BA , then $(A + B)^2 = A^2 + 2AB + B^2$.

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32. Let $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix}, B = \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}, C = \begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$ and $a = 4, b = -2$ shows that :

(i) $A + (B + C) = (A + B) + C$

(ii) $A \cdot (BC) = (AB) \cdot C$

(iii) $(a + b)B = a \cdot B + b \cdot B$

(iv) $a(C - A) = aC - aA$

(v) $\left(A^T\right)^T = A$

(vi) $(b \cdot A)^T = B^T = b \cdot A^T$

(vii) $(A \cdot B)^T = B^T \cdot A^T$

(viii) $(A - B) \cdot C = AC - BC$

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

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33. If $A = \begin{bmatrix} \cos q & \sin q \\ -\sin q & \cos q \end{bmatrix}$, then show that $A^2 = \begin{bmatrix} \cos(2q) & \sin(2q) \\ -\sin(2q) & \cos(2q) \end{bmatrix}$.

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34. If $A = \begin{bmatrix} 0 & -x \\ x & 0 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $x^2 = -1$ then show that $(A+B)^2 = A^2 + B^2$.

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35. Verify that $A^2 = I$ when $A = \begin{bmatrix} 0 & 1 & -1 \\ 4 & -3 & 4 \\ 3 & -3 & 4 \end{bmatrix}$.

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36. Prove by Mathematical Induction that $(A)^n = (A^n)$ where $n \in N$ for any square matrix A.

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37. Find inverse , by elementary row operations (if possible), of the following matrices

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

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

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38. If $\begin{bmatrix} xy & 4 \\ z+6 & x+y \end{bmatrix} = \begin{bmatrix} 8 & w \\ 0 & 6 \end{bmatrix}$, then find values of x,y,z and w.

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39. If $A = \begin{bmatrix} 1 & 5 \\ 7 & 12 \end{bmatrix}, B = \begin{bmatrix} 9 & 1 \\ 7 & 8 \end{bmatrix}$ find a matrix C such that 3A+5B+2C is a null matrix.

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40. If $A = \begin{bmatrix} 3 & -5 \\ -4 & 2 \end{bmatrix}$, then find $A^2 - 5A - 14I$. Hence , obtain A^3.

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41. Find the values of a,b ,c and d, if

$$3\begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} a & 6 \\ -1 & 2d \end{bmatrix} + \begin{bmatrix} 4 & a+b \\ c+d & 3 \end{bmatrix}$$

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42. Find the matrix X such that ,

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

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43. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 1 \end{bmatrix}$, find $A^2 + 2A + 7I$.

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44. If $A = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$, and $A^{-1} = A'$, find value of α.

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45. If the maxtrix $\begin{bmatrix} 0 & a & 3 \\ 2 & b & -1 \\ c & 1 & 0 \end{bmatrix}$ is a skew symmetric matrix , find the values of a,b,andc.

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46. If $p(x) = \begin{bmatrix} \cos x & \sin x \\ -\sin x & \cos x \end{bmatrix}$ then show that $p(x) \cdot p(y) = p(x+y)$.

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47. If A is square matrix such that $A^2 = A$, show that $(I+A)^3 = 7A + I$.

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48. If A,B are square matrices of same order and B is a skew -symmetric matrix , show that A'BA is skew symmetric.

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Solutions Of Ncert Exemplar Problems Long Answer Type Questions

1. If A and B are square matrices of the same order such that AB=Ba , then prove by inducation that $AB^n = B^n A$. Further , prove that $(AB)^n = A^n B^n$ for all $n \in N$.

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2. Find the values of x,y,z if the matrix

$A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfy the equation A'A=I.

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3. If possible , using elementary row transformations , find the inverse of the following matrices :

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

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

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

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4. Express the matrix $\begin{bmatrix} 2 & 3 & 1 \\ 1 & -1 & 2 \\ 4 & 1 & 2 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix.

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Solutions Of Ncert Exemplar Problems Objective Type Questions

1. The matrix $P = \begin{bmatrix} 0 & 0 & 4 \\ 0 & 4 & 0 \\ 4 & 0 & 0 \end{bmatrix}$ is a .....

A. square matrix

B. diagonal matrix

C. unit matrix

D. None

Answer: A

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2. Total number of possible matrices of order 3×3 with each entry 2 or 0 is .....

A. 9

B. 27

C. 81

D. 512

Answer: D

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3. If $\begin{bmatrix} 2x+y & 4x \\ 5x-7 & 4x \end{bmatrix} = \begin{bmatrix} 7 & 7y+13 \\ y & x+6 \end{bmatrix}$, then the value of x+y=.....

A. 4

B. 5

C. 6

D. 7

Answer: B

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4. If

$$A = \frac{1}{\pi}\begin{bmatrix} \sin^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & \cot^{-1}(\pi x) \end{bmatrix}, B = \frac{1}{\pi}\begin{bmatrix} -\cos^{-1}(\pi x) & \tan^{-1}\left(\frac{x}{\pi}\right) \\ \sin^{-1}\left(\frac{x}{\pi}\right) & -\tan^{-1}(\pi x) \end{bmatrix}$$

, then A-B is equal to .....

A. I

B. 0

C. 2I

D. $\frac{1}{2} \cdot I$

Answer: D

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5. If A and B are two matrices of the order $3 \times m$ and $3 \times n$, respectively , and m=n , then the order of matrix $(5A - 2B)$ is .....

A. $m \times 3$

B. 3×3

C. $m \times n$

D. $3 \times n$

Answer: D

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

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

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

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

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

Answer: D

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7. If matrix $A = [a_{ij}]_{2\times 2}$, where $a_{ij} = 1i \neq j$ then A^2 is equal to .....

A. I

B. A

C. 0

D. None of these

Answer: A

View Text Solution

8. The matrix $A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 4 \end{bmatrix}$ is a .....

A. identity matrix

B. symmetric matrix

C. skew symmetric matrix

D. None of these

Answer: B

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9. The matrix $A = \begin{bmatrix} 0 & -5 & 8 \\ 5 & 0 & 12 \\ -8 & -12 & 0 \end{bmatrix}$ is a .....

A. diagonal matrix

B. symmetric matrix

C. skew symmetric matrix

D. Scalar matrix

Answer: C

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10. If A is matrix of order $m \times n$ and B is a matrix such that AB^T and $B^T A$ both are defined , then order of matrix B is .....

A. $m \times m$

B. $n \times n$

C. $n \times m$

D. $m \times n$

Answer: D

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11. If A and B are matrices of same order , then (AB'-BA') is a .....

A. skew symmetric matrix

B. null matrix

C. symmetric matrix

D. unit matrix

Answer: A

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12. If A is a square matrix such that $A^2 = I$ then $(A - I)^3 + (A + I)^3 - 7A$ is equal to .....

A. A

B. $I - A$

C. $I + A$

D. 3A

Answer: A

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13. For any two matrices A and B , we have .....

A. AB=BA

B. $AB \neq BA$

C. $AB = 0$

D. None of these

Answer: D

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14. On using elementary column operations $C_2 \to C_2 - 2C_1$ in the following matrix equation $\begin{bmatrix} 1 & -3 \\ 2 & 4 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & 1 \\ 2 & 4 \end{bmatrix}$ we have :

A. $\begin{bmatrix} 1 & -5 \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ -2 & 2 \end{bmatrix} \cdot \begin{bmatrix} 3 & -5 \\ 2 & 0 \end{bmatrix}$

B. $\begin{bmatrix} 1 & -5 \\ 0 & 4 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & -5 \\ 2 & 0 \end{bmatrix}$

C. $\begin{bmatrix} 1 & -5 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 1 & -3 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & 1 \\ -2 & 4 \end{bmatrix}$

D. $\begin{bmatrix} 1 & -5 \\ 2 & 0 \end{bmatrix} = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} \cdot \begin{bmatrix} 3 & -5 \\ 2 & 0 \end{bmatrix}$

Answer: D

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15. On using elementary row operation $R_1 \to R_1 - 3R_2$ in the following matrix equation :

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

A. $\begin{bmatrix} -5 & -7 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & -7 \\ 0 & 3 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$

B. $\begin{bmatrix} -5 & -7 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix} \cdot \begin{bmatrix} -1 & -3 \\ 1 & 1 \end{bmatrix}$

C. $\begin{bmatrix} -5 & -7 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 1 & -7 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$

D. $\begin{bmatrix} 4 & 2 \\ -5 & -7 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ -3 & -3 \end{bmatrix} \cdot \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$

Answer: A

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Solutions Of Ncert Exemplar Problems Fillers

1. If the matrix A is both symmetric and skew symmetric ,then .....

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2. Sum of two skew symmetric matrices is always ..... matrix.

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3. The negative of a matrix is obtained by multiplying it by .....

Watch Video Solution

4. The product of any matrix by the scalar ..... Is the null matrix .

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5. A matrix which is not a square matrix is called a ..... Matrix.

Watch Video Solution

6. Matrix multiplication is ..... Over addition .

Watch Video Solution

7. If A is a symmetric matrix , then A^3 is a ..... Matrix .

View Text Solution

8. If A is skew symmetric matrix , then A^2 is a symmetric matrix .

Watch Video Solution

9. If A and B are square matrices of the same order , then

(i) (AB) = ...

(ii) (kA) ' = ...

(iii) $[k(A-B)]'$ =.....

k is any scalar)

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10. If A is skew symmetric then kA is a ..... (k is any scalar)

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11. If A, B are symmetric matrices of same order, then $AB - BA$ is a

Watch Video Solution

12. If A is symmetric matrix , then B'AB is .....

Watch Video Solution

13. If A and B are symmetric matrices of same order , then AB is symmetric if and only if ..... .

Watch Video Solution

14. In applying one or more row operations while finding A^{-1} by elementary row operations , we obtain all zero in one or more , then A^{-1} .....

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Solutions Of Ncert Exemplar Problems True False

1. A matrix denotes a number .

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2. Matrices of any order can be added .

Watch Video Solution

3. Two matrices are equal if they have same number of rows and same number of columns .

Watch Video Solution

4. Matrices of different order can not be subtracted .

Watch Video Solution

5. Matrix addition is associative as well as commutative.

Watch Video Solution

6. Matrix multiplication is commutative .

Watch Video Solution

7. A square matrix where every element is unity is called an identity matrix.

Watch Video Solution

8. If A and B are two square matirces of the same order , then $A + B = B + A$.

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9. If A and B are two matrices of the same order , then A-B=B-A.

Watch Video Solution

10. If matrix AB=O , then A=O or B=O or both A and B are null matrices .

Watch Video Solution

11. Transpose of a column matrix is a column matrix .

Watch Video Solution

12. If A and B are two square matrices of the same order , then AB=Ba.

Watch Video Solution

13. If each of the three matrices of the same order are symmetric , then their sum is a symmetric matrix.

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14. If A and B are two matrices of the same order , then (AB) =A'B.

Watch Video Solution

15. If (AB)=B'A', where A and B are not square matrices , then number of rows in A is equal to number of columns in B and number of columns in A is equal to number of rows in B.

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16. If A , B and C are square matrices of same order, then AB=AC always implies that B=C.

Watch Video Solution

17. A A' is always a symmetric matrix for any matrix A .

Watch Video Solution

18. If $A = \begin{bmatrix} 2 & 3 & -1 \\ 1 & 4 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ 4 & 5 \\ 2 & 1 \end{bmatrix}$, then AB and BA are defined and equal .

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19. If A is skew symmetric matrix , then A^2 is a symmetric matrix .

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20. $(AB)^{-1} = A^{-1} \cdot B^{-1}$, where A and B are invertible matrices satisfying commutative property with respect to multiplication.

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Practice Paper 3 Section A

1. A is a 3×3 matrix , then $|3A| = ... |A|$.

A. 3

B. 6

C. 9

D. 27

Answer:

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2. The solution of the matrix equation of $\begin{bmatrix} x^2 \\ y^2 \end{bmatrix} - 4\begin{bmatrix} 2x \\ y \end{bmatrix} = \begin{bmatrix} -7 \\ 12 \end{bmatrix} =$

.....

A. $x = 1, y = 7$

B. $x = -2, y = 6$

C. $x = 1, y = -2$

D. None of these

Answer:

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

A. $\begin{bmatrix} 11 & 8 \\ 11 & 28 \end{bmatrix}$

B. $\begin{bmatrix} 11 & 8 \\ 28 & 11 \end{bmatrix}$

C. $\begin{bmatrix} 8 & 11 \\ 11 & 28 \end{bmatrix}$

D. $\begin{bmatrix} 11 & -8 \\ -11 & 28 \end{bmatrix}$

Answer:

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4. If $A = [a_{ij}]_{n \times n}$ such that $a_{ij} = 0$, for $i \neq j$ then , A is ..... $(a_{ij} \neq a_{jj})(n > 1)$

A. column matrix

B. row matrix

C. Diagonal matrix

D. Scalar matrix

Answer:

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Practice Paper 3 Section B

1. Find the values of x,y,z and r from the equation $2\begin{bmatrix} x & z \\ y & r \end{bmatrix} + 3\begin{bmatrix} 1 & -1 \\ 0 & 2 \end{bmatrix} = 3\begin{bmatrix} 3 & 5 \\ 4 & 6 \end{bmatrix}$

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2. If $A = [1, 7]$ and $B = \begin{bmatrix} 2 & 1 \\ 3 & 4 \end{bmatrix}$, then find AB.

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3. If $A(\alpha) = \begin{bmatrix} \cos\alpha & \sin\alpha \\ -\sin\alpha & \cos\alpha \end{bmatrix}$ then prove that $A(\alpha)A(-\alpha) = I$.

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4. If the matrices $A = \begin{bmatrix} 3 & 0 \\ 4 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 \\ -4 & 3 \end{bmatrix}$, then without multiplication of matrices find $A^2 + AB + 6B$.

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Practice Paper 3 Section C

1. Find x, if $\begin{bmatrix} 1 & x & 1 \end{bmatrix} \begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix} \begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = O.$

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2. Express the matrix $A = \begin{bmatrix} 3 & 3 & -1 \\ -2 & -2 & 1 \\ -4 & -5 & 2 \end{bmatrix}$ as the sum of a symmetric and a skew symmetric matrix .

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3. Prove that : $A^2 - 6A + 17I_2 = 0$. When $A = \begin{bmatrix} 2 & -3 \\ 3 & 4 \end{bmatrix}$ Also find A^{-1}.

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4. Find the values of x,y,z if the matrix

$A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfy the equation A'A=I.

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5. નીચેના આપેલા પ્રશ્ન નંબર 9 થી 14 ની માગ્યા મુજબ ગણતરી કરી જવાબ આપો (દરેકના 3 ગુણ છે.)

જો $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix}$ હોય ,તો સાબિત કરો કે $A^n = \begin{bmatrix} 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \\ 3^{n-1} & 3^{n-1} & 3^{n-1} \end{bmatrix}, n \in N =$

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Practice Paper 3 Section D

1. If $A = \begin{bmatrix} 0 & \tan\frac{\alpha}{2} \\ \tan\frac{\alpha}{2} & 0 \end{bmatrix}$ and I theidentity matrix of order 2, show that $I + A = (I - A)\begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$.

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Practice Paper 3 Section D

1. For matrix $A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 2 & -3 \\ 2 & -1 & 3 \end{bmatrix}$. Prove that, $A^3 - 6A^2 + 5A + 11I = 0$. Hence find A^{-1} using it .

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