MATHS

BOOKS - NAGEEN MATHS (HINGLISH)

MATRICES

Solved Example

1. construst a matrix of order 2×2 whose elements are defined as $a_{ij} = i + 3j$.

A. $A = \begin{bmatrix} -4 & 7 \\ -5 & 8 \end{bmatrix}$.

B. $A = \begin{bmatrix} 4 & -7 \\ 5 & -8 \end{bmatrix}$.

C. $A = \begin{bmatrix} 4 & 7 \\ 5 & 8 \end{bmatrix}$.

D. $A = \begin{bmatrix} 4 & -7 \\ 5 & 8 \end{bmatrix}$.

Answer: C

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2. if a matric has 10 elements , write all possible order of the matrix.

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

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4. if A =diag[2 -3 4], B= diag[3 1 -2)and C= diag[-1 2 2] then find

2A-B+3C.

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5. if $A = \begin{bmatrix} 1 & 6 \\ 2 & 4 \\ -3 & 5 \end{bmatrix} B = \begin{bmatrix} 3 & 4 \\ 1 & -2 \\ 2 & -1 \end{bmatrix}$, then find a matrix C such that 2A-B+c=0

A. $\begin{bmatrix} 1 & -8 \\ -3 & -10 \\ 8 & -11 \end{bmatrix}$.

B. $\begin{bmatrix} 0 & -8 \\ -3 & -10 \\ 8 & -11 \end{bmatrix}$.

C. $\begin{bmatrix} 0 & -8 \\ -3 & -10 \\ 7 & -11 \end{bmatrix}$.

D. $\begin{bmatrix} 5 & -8 \\ -3 & -10 \\ 8 & -11 \end{bmatrix}$.

Answer: A

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6. if $2A + B = \begin{bmatrix} 5 & -1 \\ 3 & 2 \end{bmatrix}$ and $A - 2B = \begin{bmatrix} 1 & -4 \\ 0 & 5 \end{bmatrix}$ then find the matrices A and B .

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7. Find the values of X and Y

$$\begin{bmatrix} x+y \\ 3x \end{bmatrix} = \begin{bmatrix} -2 \\ 6 \end{bmatrix}.$$

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8. if $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} -3 & -2 \\ 0 & 1 \\ -4 & -5 \end{bmatrix}$, then find AB and BA ,

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9. if $A = \begin{bmatrix} 3 & -1 & 2 \\ 0 & 5 & -3 \\ 1 & -2 & 7 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$, find whether AB=BA or Not .

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10. if $A = \begin{bmatrix} 2 & -3 \\ 1 & 4 \end{bmatrix}, B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}, C = \begin{bmatrix} 3 & 1 \\ 1 & 2 \end{bmatrix}$, then show that A (BC)=(AB)c.

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11. If $\theta - \phi = \frac{\pi}{2}$, prove that, $\begin{bmatrix} \cos^2\theta & \cos\theta\sin\theta \\ \cos\theta\sin\theta & \sin^2\theta \end{bmatrix} \begin{bmatrix} \cos^2\phi & \cos\phi\sin\phi \\ \cos\phi\sin\phi & \sin^2\phi \end{bmatrix} = 0$

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12. find the transpose of the matrix $A = \begin{bmatrix} 1 & 3 & -4 \\ 0 & 2 & 1 \end{bmatrix}$.

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13. if $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} a & c \\ b & d \end{bmatrix}$, then show that $(AB)' = B'A'$

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14. Expess the matrix $A = \begin{bmatrix} 2 & 0 & -4 \\ -3 & 1 & 5 \\ 4 & -2 & 3 \end{bmatrix}$ as a sum of symmetic and skew symmetric matrices.

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15. Find the inverase of $A = \begin{bmatrix} 5 & -1 \\ 1 & 1 \end{bmatrix}$ by using elementary row transformation.

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16. Find the inverase of Matrix $A = \begin{bmatrix} 1 & 3 & -2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{bmatrix}$ by using elementary row transformation.

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17. find the inverse of matrix $A = \begin{bmatrix} 4 & 7 \\ 3 & 5 \end{bmatrix}$ by using elementary column transformation .

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Exercise 3 A

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

(I) how many columns are in A ?

(ii) How many rows are in A?

(iii) write the order of A ,

(Iv) how many elements are in A?

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2. $A = \begin{bmatrix} 2 & 0 & -1 \\ 3 & 2 & 5 \\ -1 & 4 & -3 \\ 0 & 1 & 7 \end{bmatrix}$, $then$ (i) how many cloumns are in A ? (ii) how many rows are inA ?

(iii) what is the order of A ?

(iv) How many elements are in A?

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3. (i) A matric has 12 elements ,write all possible orders of this matrix.

(ii) A matrix has 8 elements write all possible orders of this matrix.

(iii) A matrix has 15 elements , write all possible orders of this matrix.

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4. A Matrix has elements a,b,c and d constnant the matrix formed with these elements :

(i) a Matrix of order 1×4

(ii) a matrix of order 4×1

(iii) 4 matrix of order 2×2

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

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

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6. Construct a matrix $[a_{ij}]_{3\times 3}$,where $a_{ij} = \frac{i-j}{i+j}$.

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7. Construct a matrix $[a_{ij}]_{3\times 3}$, where $a_{ij} = 2i - 3j$.

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8. if $A = \begin{bmatrix} 3 & -2 \\ 7 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 \\ -1 & 4 \end{bmatrix}$, then find

$(i)A + B(ii)A - 2B$

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9. if $A = \begin{bmatrix} 1 & 2 & -5 \\ -3 & 4 & 6 \end{bmatrix}$ and $B\begin{bmatrix} -2 & 3 & -4 \\ 1 & 2 & 3 \end{bmatrix}'$ then find 2A+B.

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10. if $A = \begin{bmatrix} 1+i & -2i \\ 7 & 3-i \end{bmatrix}$ and $B = \begin{bmatrix} 1-i & 2i \\ -3 & 3+i \end{bmatrix}$, then find A+B. `

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11. if $A = \begin{bmatrix} 4 & 2 \\ -3 & 2 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 3 \\ 0 & 2 \\ 2 & -4 \end{bmatrix}$, then find 3A-4B.

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12. if $A = \begin{bmatrix} 1 & -4 & 5 \\ 2 & 1 & -3 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 3 & -1 \\ 1 & 2 & 3 \end{bmatrix}$ then find a matrix C if 2A+3B -4C is a zero matrix.

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13. if A=diag $[1 \quad 3 \quad 4], B = \text{diag}[-2 \quad 1 \quad -1], C = \text{Diag}[3 \quad -1 \quad -2]$ then find 2A +B-C.

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14. Simplify the following :

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

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15. (i) if $A+B=\begin{bmatrix}3 & 4\\ -1 & 0\end{bmatrix}$ and $A-B=\begin{bmatrix}1 & 2\\ 5 & 6\end{bmatrix}$, then find the matrix A and B.

(ii) if $X+Y=\begin{bmatrix}2 & 1\\ 1 & 2\end{bmatrix}$ and $2X-Y=\begin{bmatrix}1 & 2\\ 2 & 1\end{bmatrix}$ then find X and Y .

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16. if $2A-3B=\begin{bmatrix}4 & 2\\ -1 & 0\\ 3 & -2\end{bmatrix}$ and $3A+B=\begin{bmatrix}1 & 0\\ 3 & 5\\ -1 & 4\end{bmatrix}$, then find the matrices A And B,

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17. Find the values of x and y from each of the following matrix equation : $(i)\begin{bmatrix}x+y\\ x-y\end{bmatrix}=\begin{bmatrix}3\\ 1\end{bmatrix}(ii)\begin{bmatrix}x+y & 7\\ 0 & 2x\end{bmatrix}=\begin{bmatrix}-1 & 7\\ 0 & 6\end{bmatrix}$

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18. Find the values of x,y,z from the following matrix equation :

$$\begin{bmatrix} x+y & x+y+z \\ 2x+y & 0 \end{bmatrix} = \begin{bmatrix} 3 & 6 \\ 5 & 0 \end{bmatrix}$$

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19. find the values of x, y,z from the following matrix equation :

$$2\begin{bmatrix} x & y \\ z & o \end{bmatrix} = \begin{bmatrix} x & 6 \\ 2 & 0 \end{bmatrix} + \begin{bmatrix} 4 & x+y \\ x & 0 \end{bmatrix}$$

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20. if $A\begin{bmatrix} 2 & -3 \\ 4 & -1 \end{bmatrix}$ and $B = \begin{bmatrix} 3 & 0 \\ -1 & 2 \end{bmatrix}$, then find A matrix C such that 2A-B+3c is a unit matrix.

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Exercise 3 B

1. Find AB and BA if exists from the following matrices A and B:

$(i) A = \begin{bmatrix} 2 & 3 & -1 \\ 0 & 1 & 2 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & -6 \\ -4 & 0 \end{bmatrix}$

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

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

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2. if $A = \begin{bmatrix} 4 & 0 & -3 \\ 1 & 2 & 0 \end{bmatrix}$ and $B = \begin{bmatrix} 2 & 1 \\ 1 & -2 \\ 3 & 4 \end{bmatrix}$ 'then find AB and BA.

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3. if $A \begin{bmatrix} 0 & 3 \\ 2 & 1 \end{bmatrix}$, then find A^2

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4. if $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then show that : $A^2 = \begin{bmatrix} \cos 2\theta & \sin 2\theta \\ -\sin 2\theta & \cos 2\theta \end{bmatrix}$

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5. (i) if $A = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}, B = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, then show that $A^2 = B^2 = C^2 = I_2$.

(ii) if $A = \begin{bmatrix} 1 & 0 \\ 1 & 1 \end{bmatrix}, B = \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$ and $C = \begin{bmatrix} -1 & 2 \\ 3 & 1 \end{bmatrix}$, then show that A(B+C)=AB+AC. (iii) if $A = \begin{bmatrix} 1 & -1 \\ -1 & 1 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 1 \\ 1 & 1 \end{bmatrix}$, then show that AB is a zero matrix.

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6. if $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}, B = \begin{bmatrix} -1 & 0 \\ 2 & 3 \end{bmatrix}$ and $C = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix}$, then show that : (i) A(B+C)=AB+AC (ii) (A-B)C=AC-BC.

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7. if $A=\begin{bmatrix}3 & 2 & 1\\ 1 & 2 & 3\\ 3 & -6 & 1\end{bmatrix}, B=\begin{bmatrix}1 & 4 & 0\\ 2 & -3 & 0\\ 1 & 2 & 0\end{bmatrix}$ and $C=\begin{bmatrix}1 & 2 & 3\\ 3 & 2 & 1\\ 8 & 7 & 9\end{bmatrix}$, then find AB-AC.

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8. (i) if $A=\begin{bmatrix}4 & -1 & -4\\ 3 & 0 & -4\\ 3 & -1 & -3\end{bmatrix}$, then show that `A^(2)=I

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9. (i) if $A=\begin{bmatrix}1 & -1\\ 2 & 3\end{bmatrix}$, then show that $A^2-4A+5I=O$.

(ii) if $f(x)=x^2+3x-5$ and $A=\begin{bmatrix}2 & -1\\ 4 & 3\end{bmatrix}$, then find f(A).

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10. if $A\begin{bmatrix}1 & 3 & 2\\ 2 & 0 & 3\\ 1 & -1 & 1\end{bmatrix}$, then find $A^3 - 2A^2 + A - I_3$.

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11. Ram bought 5 dozen mangoes ,8 dozen bananas and 4 dozen oranges , the cost price of mango banana and orange are Rs. 40, Rs, 25 and Rs. 20 per dozen ,Represent the fruits in row matrix and price of the fruits .

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12. There are 20 dozen shirts , 15 Dozen pants and 25 Dozen a pair of socks in rajesh 's shop , if the cost of a shrit , a pant and a pair of socks are respectivley Rs. 60, Rs. 110 and Rs. 25, ,then find the total selling price of these things.

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Exercise 3 C

1. find the transpore of matrix $A = \begin{bmatrix} 2 & 0 \\ -1 & 4 \end{bmatrix}$.

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2. if $\begin{bmatrix} 2 & 8 \\ -7 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 3 \\ 2 & -4 \end{bmatrix}$, then show that : (i) (A+B)'=A+B' (ii) (A+2B)'=A'+2B' (iii) (AB)'=B'A'

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3. if $A = \begin{bmatrix} 1 & 0 & -3 \\ 2 & 3 & 4 \\ -4 & 5 & -2 \end{bmatrix}$ and $b = \begin{bmatrix} 3 & 0 & -1 \\ 2 & 5 & -4 \\ 4 & -1 & 2 \end{bmatrix}$, then show that :

$(AB)' = B'A'$

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4. if $A = \begin{bmatrix} 0 \\ 1 \\ 2 \end{bmatrix}$ and $B = [3 \quad 2 \quad 1]$, then show that :

$(AB)' = B'A'$

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5. if $A = \begin{bmatrix} 2 & 1 & 3 \\ 1 & -1 & 2 \\ 4 & 1 & 5 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & -1 & 2 \\ 2 & 1 & 5 \\ 4 & 1 & 3 \end{bmatrix}$, then show that :

$(i)(A+B)' = A' + B'(ii)(A+4B)' = A' + 4B'$

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6. If matrix $A = \begin{bmatrix} 1 & -4 \\ 3 & 0 \end{bmatrix}$ is express as a sum of symmetric and skew symmetric matrices as $\begin{bmatrix} 1 & x \\ -\frac{1}{2} & 0 \end{bmatrix} + \begin{bmatrix} 0 & -\frac{7}{2} \\ y & 0 \end{bmatrix}$ then $x + y = ?$

A. 0

B. 1

C. 2

D. 3

Answer: D

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7. express the following matrices as a sum of symmetric and skew symmetric matrices : $\begin{bmatrix} 3 & -7 \\ 4 & 2 \end{bmatrix}$

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8. If A and B are symmetric of the same order, then (A) AB is a symmetric matrix (B) A-B is skew symmetric (C) AB-BA is symmetric matrix (D) AB+BA is a symmetric matrix

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9. Let A be a square matrix. Then prove that $(i)A + A^T$ is a symmetric matrix,$(ii)A - A^T$ is a skew-symmetric matrix and$(iii)AA^T$ and A^TA are symmetric matrices.

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Exercise 3 D

1. find the inverse of the following matrix : $\begin{bmatrix} 1 & -1 \\ 2 & 3 \end{bmatrix}$

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2. find the inverese of the following matrices by using elementary column transformations: $(i)\begin{bmatrix} 3 & -1 \\ -4 & 2 \end{bmatrix}(ii)\begin{bmatrix} 2 & -6 \\ 1 & -2 \end{bmatrix}$

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3. if $A = \begin{bmatrix} 1 & -1 & 1 \\ 2 & 1 & -1 \\ -1 & -2 & 2 \end{bmatrix}$ then show that A^{-1} Does not exist.

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Exercise 3 E

1. A matrix of order $m \times n$ contains 7 elements, then how many different order pairs (m,n) can take ?

A. 2

B. 1

C. 3

D. 7

Answer: A

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2. Matrix $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is :

A. Zero matrix

B. Identity matrix

C. Scalar matrix

D. None of these

Answer: B

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3. $\cos\theta \begin{bmatrix} \cos\theta & -\sin\theta \\ \sin\theta & \cos\theta \end{bmatrix} + \sin\theta \begin{bmatrix} \sin\theta & \cos\theta \\ -\cos\theta & \sin\theta \end{bmatrix} = ?$

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

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

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

D. None of these

Answer: B

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4. If the order of matrix A is m $\times$ n, then the order of the transpose of matrix A is :

A. $m \times n$

B. $n \times n$

C. $n \times m$

D. $m \times m$

Answer: C

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5. If $f(x) = x^2 - 5x + 6$. Find $f(A)$, if $A = \begin{bmatrix} 2 & 0 & 1 \\ 2 & 1 & 3 \\ 1 & -1 & 0 \end{bmatrix}$.

A. $\begin{bmatrix} 1 & -1 & -3 \\ -1 & 1 & 10 \\ -5 & 4 & 4 \end{bmatrix}$

B. $\begin{bmatrix} 1 & -1 & -3 \\ -1 & -1 & -10 \\ -5 & -4 & -4 \end{bmatrix}$

C. $\begin{bmatrix} 1 & -1 & -3 \\ -1 & -1 & -10 \\ -5 & 4 & 4 \end{bmatrix}$

D. None of these

Answer: C

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6. if $A = \begin{bmatrix} 3 & -2 \\ 4 & -2 \end{bmatrix}, I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ and $A^2 = k.A - 2l$, then$k = ?$

A. 1

B. -1

C. 2

D. None of these

Answer: A

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7. if $x\begin{bmatrix}2\\3\end{bmatrix}+y\begin{bmatrix}-1\\5\end{bmatrix}=\begin{bmatrix}4\\19\end{bmatrix}$, then the values of x and y are:

A. $x=y, y=3$

B. $x=6, y=8$

C. $x=3, y=2$

D. None of these

Answer: C

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8. If $A = \begin{bmatrix} 3 & -1 \\ 2 & 5 \end{bmatrix}$, then $A + A^T = ?$

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

B. $\begin{bmatrix} 6 & 1 \\ 1 & 10 \end{bmatrix}$

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

D. None of these

Answer: B

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9. if $A = \begin{bmatrix} \cos\theta & \sin\theta \\ -\sin\theta & \cos\theta \end{bmatrix}$, then AA^T=?`

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

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

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

D. None of these

Answer: A

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10. if A and B are symmetric matrices of same order then $(AB - BA)$ is :

A. Zero matrix

B. identity matrix

C. skew symmetric matrix

D. symmetric matrix

Answer: C

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Exercise 3 F

1. If $F(x) = \begin{bmatrix} \cos^2 x & \cos x \sin x \\ \cos x \sin x & \sin^2 x \end{bmatrix}$ and the difference of x and y is the odd Multiple of $\frac{\pi}{2}$, then $F(x)F(y)$is :

A. Zero matrix

B. unit matrix

C. diagonal matrix

D. None of these

Answer: B

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2. If $A = \begin{bmatrix} a & b \\ b & a \end{bmatrix}$ and $A^2 = \begin{bmatrix} \alpha & \beta \\ \beta & \alpha \end{bmatrix}$ then

A. $\alpha = a^2 - b^2, \beta = 2ab$

B. $\alpha = 2ab, \beta = a^2 + b^2$

C. $\alpha = a^2 + b^2, \beta = 2ab$

D. $\alpha = 2ab, \beta = a^2 - b^2$

Answer: C

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

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

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

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

D. None of these

Answer: B

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4. If A and B are square matrices of same order, then which of the following is true -

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

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

C. $AB = O \Rightarrow A = O \text{ or } B = O$

D. None of these

Answer: B

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

A. the order of A and B are not same necessarily,

B. No. of columns in $A = N \odot$ of rows in B.

C. A and B are square matrices of same order.

D. No. of rows in A=No. Of columns in B.

Answer: C

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6. if $A = \begin{bmatrix} 0 & 1 \\ 1 & 0 \end{bmatrix}$, then $A^4 = ?$

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

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

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

D. None of these

Answer: C

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7. If $A = \begin{bmatrix} 4 & x+2 \\ 2x-3 & x+1 \end{bmatrix}$ is a symmetric matrix, then $x = ?$

A. 2

B. 3

C. 4

D. 5

Answer: D

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

A. 2AB

B. 2BA

C. A+B

D. AB

Answer: C

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9. If A is a skew-symmetric matrix and n is odd positive integer, then A^n is

A. a skew symmertric matrix

B. a symmetric matrix

C. a zero matrix

D. None of these

Answer: A

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10. If A is a symmetric matrix and $n \in N$ then A^n is

A. a skew symmetric matrix

B. a symmetric matrix

C. a zero matrix

D. None of these

Answer: B

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Exercise 3 1

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

(i) the order of the matrix,

(ii) the number of elements ,

(iii) write the elements ,$a_{13}, a_{21}, 1_{33}, 1_{24}, a_{23}$.

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2. If a matrix has 24 elements, what are the possible orders it can have?

What, if it has 13 elements?

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3. If a matrix has 18 elements, what are the possible orders it can have?

What, if it has 5 elements?

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4. Construst a 2×2 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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5. Construct a 3×4matrix, whose elements are given by:(i) $a_{ij} = \frac{1}{2}|-3i+j|$ (ii) $a_{ij} = 2i - j$

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6. find the values of x,y and zfrom 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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7. Find the value of a, b, c and d from the equation:

$[a-b2a+c2a-b3c+d] = [-15013]$

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8. A square matrix $A = [a_{ij}]$ in which $a_{ij} = 0$ for $i \neq j$ and $[a]_{ij} = k$ (constant) for $i = j$ is called a

A. unit matrix

B. scalar matrix

C. null matrix

D. diagonal matrix

Answer: B

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9. Which of the given values of x and y make the following pair of matrices equal $[3x + 75y + 12 - 3x], [0y - 284]$ (a) $x = \frac{-1}{3}, y = 7$ (b) Not possible to find (c) $y = 7, x = \frac{-2}{3}$ (d) $x = \frac{-1}{3}, y = \frac{-2}{3}$

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

A. 27

B. 28

C. 81

D. 512

Answer: D

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Exercise 3 2

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

find each of the following :

(i) A+B (ii) A-B

(iii) 3A-C (iv) AB

(V) BA

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2. compute the following :

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

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

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

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

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3. compute the indicated products .

$(i)\begin{bmatrix} a & b \\ -b & a \end{bmatrix}\begin{bmatrix} a & -b \\ b & a \end{bmatrix}$ $(ii)\begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}[2 \quad 3 \quad 4]$ $(iii)\begin{bmatrix} 1 & -2 \\ 2 & 3 \end{bmatrix}\begin{bmatrix} 1 & 2 & 3 \\ 2 & 3 & 1 \end{bmatrix}$

(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 compure (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 $B=\begin{bmatrix}\frac{2}{3} & \frac{2}{5}1\frac{1}{5} & \frac{2}{5} & \frac{4}{5} & \frac{7}{3} & \frac{6}{5} & \frac{2}{5}\end{bmatrix}$, then compute $3A \quad 5B$.

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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(i) $X+Y=[7025]$and $X-Y=[3003]$(ii) $2X+3Y=[2340]$and $3X+2Y=[2-2-15]$

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8. Find X if $Y=[3214]$ and $2X+Y=[10-32]$.

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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 $2[xzyt] + 3[1 - 102] = 3[3546]$

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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 the values of x and y.

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12. Given $3[xyzw] - [x6 - 12w] + [4x + yz + w3]$, find the values of x, y, z and w.

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

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

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

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

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16. If $A = [102021203]$, prove that $A^3 - 6A^2 + 7A + 2I = 0$

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17. If A $A = [3 - 24 - 2]$and $I = [1001]$, find k so that $A^2 = kA - 2I$.

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

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19. A trust fund has Rs. 30000 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 30000 among the two types of bonds. If the trust fund must obtain an annual total interest of (i) Rs 1800 (ii) 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

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21. the restriction on n, k and p so that PY +Wywill be defined are :

A. K=3,p=n

B. K is arbitrary , p=2

C. p is arobitray , k-3

D. $k = 2, p = 3$

Answer: A

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22. If $n = p$, then the order of the matrix $7X \quad 5Z$ is: (A) $p \times 2$ (B) $2 \times n$ (C) $n \times 3$ (D) $p \times n$

A. $p \times 2$

B. $2 \times n$

C. $n \times 3$

D. $p \times n$

Answer: A

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Exercise 3 3

1. Find the transpose of each of the following matrices:(i) $\left[5\frac{1}{2} \quad -1\right]$ (ii) $[1 \quad -123]$ (iii) $\left[-156\sqrt{35623} \quad -1\right]$

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2.

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

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

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4. If $A' = \begin{bmatrix} -2 & 3 \\ 1 & 3 \end{bmatrix}$ and $B = \begin{bmatrix} -1 & 0 \\ 1 & 2 \end{bmatrix}$, find $[A+2B]'$.

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5. For the matrices A and B, verify that $(AB)' = B'A'$, where(i) $A = [1 \ -4 \ 3], B = [-1 \ 2 \ 1]$ (iii) $A = [0 \ 1 \ 2], B = [1 \ 5 \ 7]$

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6. If (i) $A = [\cos\alpha \ \sin\alpha \ -\sin\alpha \ \cos\alpha]$, then verify that $A'A = I$.(ii) $A = [\sin\alpha \ \cos\alpha \ -\cos\alpha \ \sin\alpha]$, then verify that $A'A = I$.

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7. (i) Show that the matrix $A = [1 \ -1 \ 5 \ -1 \ 2 \ 1 \ 5 \ 1 \ 3]$ is a symmetric matrix. (ii) Show that the matrix $A - [0 \ 1 \ -1 \ -1 \ 2 \ 1 \ 1 \ -1 \ 0]$ is a skew symmetric matrix.

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8. 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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9. Find $\frac{1}{2}(A + A')$ and $\frac{1}{2}(A - A')$, when $A = [0ab - a0c - b - c0]$

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10. Express the following matrices as the sum of a symmetric and a skew symmetricmatrix:(i) $[351 - 1]$ (ii) $[6 - 22 - 23 - 12 - 13]$ (iii) $[33 - 1 - 2 - 21452]$ (iv) $[15 - 12]$

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11. If A and B are symmetric matrices of the same order then (A) A-B is skew symmetric (B) A+B is symmetric (C) AB-BA is skew symmetric (D) AB+BA is symmetric

A. skew symmetric matrix

B. symmetric symmetric matrix

C. zero matrix

D. identity matrix

Answer: A

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12. If $A = \begin{bmatrix} \cos\alpha & -\sin\alpha \\ \sin\alpha & \cos\alpha \end{bmatrix}$ then $A + A' = I$ then $\alpha =$

A. $\frac{\pi}{6}$

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

C. Π

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

Answer: A

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Exercise 3 4

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

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2. $\begin{bmatrix} 2 & 1 \\ 1 & 1 \end{bmatrix}$ find the inverse of matrix

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3. $\begin{bmatrix} 1 & 3 \\ 2 & 7 \end{bmatrix}$ find the inverse of matrix

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4. $\begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$ find the inverse of the matrix

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5. Multiplicative inverse of the matrix $\begin{bmatrix} 2 & 1 \\ 7 & 4 \end{bmatrix}$ is (i) $\begin{bmatrix} 4 & -1 \\ -7 & -2 \end{bmatrix}$ (ii) $\begin{bmatrix} -4 & -1 \\ 7 & -2 \end{bmatrix}$ (iii) $\begin{bmatrix} 4 & -1 \\ 7 & 2 \end{bmatrix}$ (iv) $\begin{bmatrix} 4 & -1 \\ -7 & 2 \end{bmatrix}$

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

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7. $\begin{bmatrix} 3 & 1 \\ 5 & 2 \end{bmatrix}$ using elementry method find the inverse of matrix

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8. $\begin{bmatrix} 4 & 5 \\ 3 & 4 \end{bmatrix}$ find the inverse of matrix

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9. $\begin{bmatrix} 3 & 10 \\ 2 & 7 \end{bmatrix}$ find the inverse of matrix

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10. Using elementary transformations, find the inverse of the matrix $[3 - 1 - 42]$

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11. $\begin{bmatrix} 2 & -6 \\ 1 & -2 \end{bmatrix}$ find inverse of matrix

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12. find inverse using elementary operations $\begin{bmatrix} 6 & -3 \\ -2 & 1 \end{bmatrix}$

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

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

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

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

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

Answer: B

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14. $\begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix}$ find the inverse of matrix

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15. If $A = \begin{bmatrix} 2 & -3 & 3 \\ 2 & 2 & 3 \\ 3 & -2 & 2 \end{bmatrix}$ then

$C_2 \to C_2 + 2C_1$ and then $R_1 \to R_1 + R_3$ gives

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16. Using elementary transformations, find the inverse of the matrix

$(13 - 2 - 30 - 1210)$

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17. $A = \begin{bmatrix} 2 & 0 & -1 \\ 5 & 1 & 0 \\ 0 & 1 & 3 \end{bmatrix} A^{-1} = ?$

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

A. AB=BA

B. AB=BA=O

C. AB=O,BA=I

D. AB+BA=I

Answer: A

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Miscellaneous Exerice

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

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2. If $A = [111111111]$, then prove that $A^n = [3^{n-1}3^{n-1}3^{n-1}3^{n-1}3^{n-1}3^{n-1}3^{n-1}3^{n-1}3^{n-1}]$ for every positive integer n.

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3. If $A = [3 - 41 - 1]$, then prove that $A^n = [1 + 2n - 4 \cap 1 - 2n]$, 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^TAB 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 $A = [02yzxy - zx - yz]$ satisfy the equation $A'A = I$.

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7. for what values of x:

$$\begin{bmatrix}1 & 2 & 1\end{bmatrix}\begin{bmatrix}1 & 2 & 0\\ 2 & 0 & 1\\ 1 & 0 & 2\end{bmatrix}\begin{bmatrix}0\\ 2\\ x\end{bmatrix} = 0?$$

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8. if $A = \begin{bmatrix}3 & 1\\ -1 & 2\end{bmatrix}$, show that $A^2 - 5A + 7I = 0$.

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9. find x, if

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

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

Market		products	
I	10,000	2,000	18,000
II	6,000	20,000	8,000

(A) if unit sale prices of x,y and z are Rs. 2.50, Rs. 1.50 and Rs. 1.00, respectively , find the total revenue algebra .

(b) if the unit costs of the above three commodities are Rs. 2.00,Rs. 1.00 and 50 paise respectively, 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 proveby induction that $AB^n=B^nA$. Further, prove

that $(AB)^n = A^n B^n$ for all $n \in N$.

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13. If $A = [\alpha\beta\gamma - \alpha]$ is such that $A^2 = I$, then $1 + \alpha^2 + \beta\gamma = 0$ (b) $1 - \alpha^2 + \beta\gamma = 0$ (c) $1 - \alpha^2 - \beta\gamma = 0$ (d) $1 + \alpha^2 - \beta\gamma = 0$

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

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14. A matrix which is both symmetric as well as skew-symmetric is

A. A is a diagonal matrix

B. A is a zero matrix

C. A is a square matrix

D. None of the above

Answer: B

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15. If A is a 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: A