MATHS

BOOKS - NCERT MATHS (ENGLISH)

MATRICES

Solved Example

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

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) elements a_{23}, a_{31} and a_1,

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

(i) $a_{ij} = \frac{(i - 2j)^2}{2}$ (ii) $a_{ij} = \left| -2\hat{i} + 3j \right|$

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4. Construct a 3×2 matrix whose elements are given by $a_{ij} = e^{i.x} - \sin jx$.

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5. Find the values of $a \text{ and } b$ if $A = B$, where $A = [a + 43b8 - 6], B = [2a + 2b^2 + 28b^2 - 56]$

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

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

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

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

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10. Find the value of x, if $[1 x 1]\begin{bmatrix} 1 & 3 & 2 \\ 2 & 5 & 1 \\ 15 & 3 & 2 \end{bmatrix}\begin{bmatrix} 1 \\ 2 \\ x \end{bmatrix} = 0$

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

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

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

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

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15. If $A = \begin{bmatrix} 2 & 1 & 2 \\ 1 & 2 & 4 \end{bmatrix}$ and $B = \begin{bmatrix} 4 & 1 \\ 2 & 3 \\ 1 & 2 \end{bmatrix}$ Find AB and BA (

if it exist)

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16. Give an example of two non-zero 2×2 matrices A and

B such that $AB = O$.

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

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18. Solve for x and y , $x\begin{bmatrix}2\\1\end{bmatrix}+y\begin{bmatrix}3\\5\end{bmatrix}+\begin{bmatrix}-8\\-11\end{bmatrix}=0.$

A.

B.

C.

D.

Answer:

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19. If X and Y are 2×2 matrices, then solve the following matrix equations for X and $Y\cdot$ $2X+3Y=[2340]$,

$3X + 2Y = [-221 - 5]$

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20. If $A = [35], B = [73]$, then find a non-zero matrix C such that AC=BC.

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21. Give an example of three matrices $A,\ B,\ C$ such that $AB = AC$ 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 $C = \begin{bmatrix} 1 & 0 \\ -1 & 0 \end{bmatrix}$, verfity (i) A(B+C)=AB+AC.

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23. If $P = [x000y000z]$ and $Q = [a000b000c]$, prove that $PQ = [xa000yb000zc] = QP$

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24. If [2 1 3] $\begin{bmatrix} -1 & 0 & -1 \\ -1 & 1 & 0 \\ 0 & 1 & 1 \end{bmatrix} \begin{bmatrix} 1 \\ 0 \\ -1 \end{bmatrix}$ =A, then find the value of A.

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25. If $A = \begin{bmatrix} 2 & 1 \\ 4 & 2 \end{bmatrix}, B = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 4 & 0 \end{bmatrix}$ and $C = \begin{bmatrix} -1 & 2 & 1 \\ 1 & 0 & 2 \end{bmatrix}$ then veri fy that $A(B + C) = (AB + AC)$.

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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 3×3 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) (AB)'=B'A'

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28. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 1 \\ 5 & 6 \end{bmatrix}$ and $B = \begin{bmatrix} 1 & 2 \\ 6 & 4 \\ 7 & 3 \end{bmatrix}$, then varify that (i) (A-B)'=A'-B'

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

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

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

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32. If $A = \begin{bmatrix} 1 & 2 \\ -1 & 3 \end{bmatrix} B = \begin{bmatrix} 4 & 0 \\ 1 & 5 \end{bmatrix}, C = \begin{bmatrix} 2 & 0 \\ 1 & -2 \end{bmatrix}$ a=4 and b=-2, then show that (i) (a+b)B=aB+bB (ii) a(C-A)=aC-aA

(iii) $(bA)^T = bA^T$

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33. If $A = \begin{bmatrix} \cos q & \sin q \\ -\sin q & \cos q \end{bmatrix}$, then variefy 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. If A is a square matrix, using mathematical induction prove that $\left(A^T\right)^n = (A^n)^T$ for all $n \in N$.

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37. Find inverse, by elementary row operations (if possible) , of both 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 the values of x,y,z and w.

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

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

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

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43. If $A = \begin{bmatrix} 1 & 2 \\ 4 & 1 \end{bmatrix}$, then 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 $A^{-1} = A$' then find the value of α.

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

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

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

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

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49. Let A, B be two matrices such that they commute. Show that for any positive integer n, (i) $AB^n = B^n A$ (ii) $(AB)^n = A^n B^n$

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50. Find $A = \begin{bmatrix} 0 & 2y & z \\ x & y & -z \\ x & -y & z \end{bmatrix}$ satisfies $A^T = A^{-1}$

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51. Using elementary transformations (operations), find the inverse of the following matrices, if it exists

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

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

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53. 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 of these

Answer:

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

A. x =3,y=1

B. x=2,y=3

C. x=2,y=4

D. x=3,y=3

Answer: B

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56. If

$$A = \frac{1}{\pi}\left[\sin^{-1}(\pi x)\tan^{-1}\left(\frac{x}{\pi}\right)\sin^{-1}\left(\frac{x}{\pi}\right)\cot^{-1}(\pi x)\right]$$

and

$$B = \frac{1}{\pi}\left[-\cot^{-1}(\pi x)\tan^{-1}\left(\frac{x}{\pi}\right)\sin^{-1}\left(\frac{x}{\pi}\right) - \tan^{-1}(\pi x)\right]$$

, then $A - B$ is equal to I (b) 0 (c) $2I$ (d) $\frac{1}{2}I$

A. I

B. 0

C. 2I

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

Answer:

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

A. $m \times 3$

B. 3×3

C. $m \times n$

D. $3 \times n$

Answer: D

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58. 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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59. If matrix $A = [a_{ij}]_{2X2}$, where $a_{ij} = \begin{Bmatrix} 1 & i \neq j \\ 0 & i = j \end{Bmatrix}, then A^2$ is equal to

A. I

B. A

C. 0

D. none of these

Answer:

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

A. identify

B. symmetric matrix

C. skew-symmetric matrix

D. none of these

Answer:

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61. The matrix $A = [0 - 585012 - 8 - 120]$ is a (a) diagonal matrix (b) symmetric matrix (c) skew-symmetric matrix (d) scalar matrix

A. diagonal matrix

B. symmetric matrix

C. skew-symmetric matrix

D. scalar matrix.

Answer:

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62. If A is matrix of order $m \times n$ and B is a matrix such that AB' and B'A are both 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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63. if A and B are matrices of same order, then $(AB' - BA')$ is a 1) null matrix 3)symmetric matrix 2) skew -symmetric matrix 4)unit matrix

A. skew-symmetric matrix

B. null matrix

C. symmetric matrix

D. unit matrix

Answer:

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64. 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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65. For any two matrices A and B , we have

A. AB=BA

B. $AB \neq BA$

C. $AB = O$

D. none of these

Answer:

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66. On usign elementry column operation $C_2 \Rightarrow C_2 - 2C_1$ in the following matrix equation $\begin{bmatrix} 1 & -3 \\ 2 & 4 \end{bmatrix} = \begin{bmatrix} 1 & 01 \\ 0 & 1 \end{bmatrix}\begin{bmatrix} 3 & 1 \\ 2 & 4 \end{bmatrix}$, we have

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

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

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

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

Answer:

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67. On using row operation $R_1 \Rightarrow R_1 - 3R_2$ in the following matrix equation $\begin{bmatrix} 4 & 2 \\ 3 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 2 \\ 0 & 3 \end{bmatrix} \begin{bmatrix} 2 & 0 \\ 1 & 1 \end{bmatrix}$ we have

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

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

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

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

Answer:

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68. .... Matrix is both symmetric and skew-symmetric matrix.

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69. Sum of two skew-symmetric matrices is always .... Matrix.

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70. The negative of a matrix is obtained b y multiplying it by ....

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

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72. A matrix which is not a square matrix is called a..........matrix.

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73. Matrix multiplication is distributive over matrix addition

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

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

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

(i) (AB)=.........

(ii) (KA)=.......... (where, k is any scalar)

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

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77. If A is a skew-symmetric, then kA is a...........(where, k is any scalar) .

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78. If A and B are symmetric matrices, then

(i) AB-BA is a ....

(ii) BA-2AB is a............

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

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

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

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82. A matrix denotes a number

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83. Matrices of any order can be added.

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84. Two matrices are equal. If they have same number of rows and same number columns.

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85. Matrices of different order cannot be subtracted.

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86. Matrix addition is associative as well as commutative.

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87. Matrix m ultiplication is commutative.

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88. A square m atrix where every element is unity is called an identity matrix.

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89. If A and B are two square matrices of the same order, then A+B=B+A.

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90. If A and B are two m atrices of the same order, then A-B=B-A.

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91. If A dn B be 3×3 matrices the AB=0 implies (A) $A = 0 \text{ or } B = 0$ (B) $A = 0 \text{ and } B = 0$ (C) $|A| = 0 \text{ or } |B| = 0$ (D) $|A| = 0 \text{ and } |B| = 0$

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92. Transpose of a column matrix is a column matrix.

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93. If A and B are square matrices of the same order such that $AB = BA$, then show that

$(A+B)^2 = a^2 + 2AB + B^2$

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

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

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96. If (AB)=BA, 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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97. Let A; B; C be square matrices of the same order n. If A is a non singular matrix; then $AB = AC$ then $B = C$

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

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99. 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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100. If A is skew-symmetric matrix then A^2 is a symmetric matrix.

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101. If A; B are invertible matrices of the same order; then show that $(AB)^{-1}=B^{-1}A^{-1}$

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