MID TERM

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Course:- Linear Algebra

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Field :- Data Science

Date :- 8th Sep, 2020

QUESTION:- 1

$$A = \begin{bmatrix} 9 & 7 \\ 4 & 1 \\ 5 & 8 \end{bmatrix} \text{ and } B = \begin{bmatrix} 1 & 2 \\ 3 & 3 \\ 2 & 2 \end{bmatrix}$$

Find:-

a) - A + B

b) - A - B

c) - B - A

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Solution :-

a). A + B

$$A = \begin{bmatrix} 9 & 7 \\ 4 & 1 \\ 5 & 8 \end{bmatrix} + B = \begin{bmatrix} 1 & 2 \\ 3 & 3 \\ 2 & 2 \end{bmatrix}$$

$$A+B = \begin{bmatrix} 9+1 & 7+2 \\ 4+3 & 1+3 \\ 5+2 & 8+2 \end{bmatrix}$$

$$A+B = \begin{bmatrix} 10 & 9 \\ 7 & 4 \\ 7 & 10 \end{bmatrix}$$ Ans.

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b)- A - B

$$A = \begin{bmatrix} 9 & 7 \\ 4 & 1 \\ 5 & 8 \end{bmatrix} \quad - \quad B = \begin{bmatrix} 1 & 2 \\ 3 & 3 \\ 2 & 2 \end{bmatrix}$$

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

$$A-B = \begin{bmatrix} 8 & 5 \\ 1 & -2 \\ 3 & 6 \end{bmatrix}$$

Ans.

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c)- B-A

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

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

$$B-A = \begin{bmatrix} -8 & -5 \\ -1 & 2 \\ -3 & -6 \end{bmatrix}$$ Ans

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QUESTION:- 2

$$A = \begin{bmatrix} 2 & 4 \\ 4 & 3 \\ 5 & 1 \end{bmatrix} \quad \text{and} \quad B = \begin{bmatrix} 1 & 3 \\ 0 & 2 \\ 6 & 7 \end{bmatrix}$$

Find $2A + 3B$

Solution:-

First finding $2A$.

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

$$2A = \begin{bmatrix} 4 & 8 \\ 8 & 6 \\ 10 & 2 \end{bmatrix}$$

Finding $3B$:-

$$3B = 3\begin{bmatrix} 1 & 3 \\ 0 & 2 \\ 6 & 7 \end{bmatrix}$$

$$3B = \begin{bmatrix} 3 & 9 \\ 0 & 6 \\ 18 & 21 \end{bmatrix}$$

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Now Finding $2A+3B$:-

$$2A+3B = \begin{bmatrix} 4 & 8 \\ 8 & 6 \\ 10 & 2 \end{bmatrix} + \begin{bmatrix} 3 & 9 \\ 0 & 6 \\ 18 & 24 \end{bmatrix}$$

$$2A+3B = \begin{bmatrix} 4+3 & 8+9 \\ 8+0 & 6+6 \\ 10+18 & 2+24 \end{bmatrix}$$

$$2A+3B = \begin{bmatrix} 7 & 17 \\ 8 & 12 \\ 28 & 23 \end{bmatrix}$$ Ans.

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QUESTION-3

Given

$$A=\begin{bmatrix}2 & 3 & 4\\ 1 & 5 & 5\end{bmatrix} \text{ and } B=\begin{bmatrix}5 & 6\\ 3 & 8\\ 2 & 3\end{bmatrix}$$

2×3 $\qquad$ 3×2

Find I) $A\times B$

II) $B\times A$

Solution:-

I).- $A\times B$

$$A=\begin{bmatrix}2 & 3 & 4\\ 1 & 5 & 5\end{bmatrix} \times B=\begin{bmatrix}5 & 6\\ -3 & 8\\ 2 & 3\end{bmatrix}$$

$$A\times B=\begin{bmatrix}2\times5+3\times-3+4\times2 & 2\times6+3\times8+4\times3\\ 1\times5+5\times-3+5\times2 & 1\times6+5\times8+5\times3\end{bmatrix}$$

$$A\times B)=\begin{bmatrix}10+9+8 & 12+24+12\\ 5+15+10 & 6+40+15\end{bmatrix}$$

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$$A \times B = \begin{bmatrix} 27 & 48 \\ 30 & 61 \end{bmatrix}$$ Ans.

II). B x A

$$B = \begin{bmatrix} 5 & 6 \\ 3 & 8 \\ 2 & 3 \end{bmatrix} \quad 3 \times 2 \qquad \times \qquad A = \begin{bmatrix} 2 & 3 & 4 \\ 1 & 5 & 5 \end{bmatrix} \quad 2 \times 3$$

$$BXA = \begin{bmatrix} 5\times2+6\times1 & 5\times3+6\times5 & 5\times4+6\times5 \\ 3\times2+8\times1 & 3\times3+8\times5 & 3\times4+8\times5 \\ 2\times2+3\times1 & 2\times3+3\times5 & 2\times4+3\times5 \end{bmatrix}$$

$$BXA = \begin{bmatrix} 10+6 & 15+30 & 20+30 \\ 6+8 & 9+40 & 12+40 \\ 4*3 & 6*15 & 8+15 \end{bmatrix}$$

$$BXA = \begin{bmatrix} 16 & 45 & 50 \\ 14 & 49 & 52 \\ 7 & 21 & 23 \end{bmatrix}$$ Ans

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QUESTION:-4

Find the inverse of the following square matrix.

$$A = \begin{bmatrix} 1 & 5 \\ 2 & 9 \end{bmatrix}$$

Solution:-

Applying inverse formula:-

$$\text{i.e } \frac{1}{ad-bc}\begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$$

$$= \frac{1}{(1)(9)-(5)(2)}\begin{bmatrix} 9 & -5 \\ -2 & 1 \end{bmatrix}$$

$$= \frac{1}{9-10}\begin{bmatrix} 9 & -5 \\ -2 & 1 \end{bmatrix}$$

$$= -\frac{1}{1}\begin{bmatrix} 9 & -5 \\ -2 & 1 \end{bmatrix}$$

$$= \begin{bmatrix} -9 & 5 \\ 2 & -1 \end{bmatrix}$$ Ans.

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