Week 2 Notes and Exercises

1 Notes

Matrix operations

Calculate $A+B$ and $A-B$ or state why you can't.

a)

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

$$A+B=\begin{bmatrix}0&3&9\\1&4&-1\\2&-5&-3\end{bmatrix}, A-B=\begin{bmatrix}2&-3&-1\\-3&0&5\\-2&1&-3\end{bmatrix}$$

b)

$$A=\begin{bmatrix}-1&0&5&6\\-4&-3&5&-2\end{bmatrix}, B=\begin{bmatrix}-3&9&-3&4\\0&-2&-1&2\end{bmatrix}$$

$$A+B=\begin{bmatrix}-4&9&2&10\\-4&-5&4&0\end{bmatrix}$$

Exercises find AB or state why it doesn't exist.

a)

$$A=\begin{bmatrix}1&0&1\\0&-1&-1\\-1&1&0\end{bmatrix}, B=\begin{bmatrix}0&1&-1\\1&-1&0\\-1&0&1\end{bmatrix}$$

b)

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

2 Exercise 2.1

Questions 1,2,3,7,8,9,10,12

In Exercise 1 and 2, compute each matrix sum or product if it is defined. If an expression is undefined, explain why. Let

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

Sum

$$A+B=\begin{bmatrix}2+7&0+(-5)&-1+1)\\4+1&-5+(-4)&2+(-3)\end{bmatrix}=\begin{bmatrix}9&-5&0\\5&-9&-1\end{bmatrix}$$

$$C+D=\begin{bmatrix}1+3&2+5\\-2+(-1)&1+4\end{bmatrix}=\begin{bmatrix}4&2\\-3&5\end{bmatrix}$$

Rest of matrices can't be added together since they don't have the same dimensions.

Product

$$C_{2\times2} \cdot A_{2\times3} = \begin{bmatrix} 1\cdot2+2\cdot4 & 1\cdot0+2\cdot-5 & 1\cdot-1+2\cdot2 \\ -2\cdot2+1\cdot4 & -2\cdot0+1\cdot-5 & -2\cdot-1+1\cdot2 \end{bmatrix} = \begin{bmatrix} 10 & -10 & 3 \\ 0 & -5 & 4 \end{bmatrix}$$

$$C_{2\times2} \cdot B_{2\times3} = \begin{bmatrix} 1\cdot7+2\cdot1 & 1\cdot-5+2\cdot-4 & 1\cdot1+2\cdot-3 \\ -2\cdot7+1\cdot1 & -2\cdot-5+1\cdot-4 & -2\cdot1+1\cdot-3 \end{bmatrix} = \begin{bmatrix} 9 & -13 & -5 \\ -13 & 6 & -5 \end{bmatrix}$$

$$C_{2\times2} \cdot D_{2\times2} = \begin{bmatrix} 1\cdot3+2\cdot5 & 1\cdot5+2\cdot4 \\ -2\cdot3+1\cdot-1 & -2\cdot5+1\cdot4 \end{bmatrix} = \begin{bmatrix} 13 & 13 \\ -7 & -5 \end{bmatrix}$$

$$C_{2\times2} \cdot E_{2\times1} = \begin{bmatrix} 1\cdot-5+2\cdot3 \\ -2\cdot-5+1\cdot3 \end{bmatrix} = \begin{bmatrix} 1 \\ 13 \end{bmatrix}$$

$$D_{2\times2} \cdot A_{2\times3} = \begin{bmatrix} 3\cdot2+5\cdot4 & 3\cdot0+5\cdot-5 & 3\cdot-1+5\cdot2 \\ -1\cdot2+4\cdot4 & -1\cdot0+4\cdot-5 & -1\cdot-1+4\cdot2 \end{bmatrix} = \begin{bmatrix} 26 & -25 & 7 \\ 6 & -20 & 9 \end{bmatrix}$$

$$D_{2\times2} \cdot B_{2\times3} = \begin{bmatrix} 3\cdot7+5\cdot1 & 3\cdot-5+5\cdot-4 & 3\cdot1+5\cdot-3 \\ -1\cdot7+4\cdot1 & -1\cdot-5+4\cdot-4 & -1\cdot1+4\cdot-3 \end{bmatrix} = \begin{bmatrix} 26 & -35 & -12 \\ -3 & -11 & -13 \end{bmatrix}$$

$$D_{2\times2} \cdot E_{2\times1} = \begin{bmatrix} 3\cdot-5+5\cdot3 \\ -1\cdot-5+4\cdot3 \end{bmatrix} = \begin{bmatrix} 0 \\ 17 \end{bmatrix}$$

Rest of matrices can't have a dot product since they don't have the required dimensions.

3 Exercise 2.2

Questions 1,2,3,4,5,6,7a,8,29-32