YINI Maths Course

Section 1: Introduction to matrices

Section test

1. What is the order of the matrix $\begin{pmatrix} 3 & 8 & 6 & 2 & 0 \\ -2 & 4 & -1 & 0 & 2 \\ 3 & 0 & 0 & 2 & -4 \end{pmatrix}$?

2. **A** is the matrix $\begin{pmatrix} -1 & 2 \\ 1 & 3 \end{pmatrix}$ and **B** is the matrix $\begin{pmatrix} 2 & 4 \\ 0 & -1 \end{pmatrix}$.

   Find:
   (i) **A** + **B**
   (ii) **A** − **B**
   (iii) 3**A** − 2**B**

In the following questions,

A is the matrix $\begin{pmatrix} 2 & 3 \\ 1 & 3 \end{pmatrix}$ 　　　　**B** is the matrix $\begin{pmatrix} 2 & 3 \\ 4 & 6 \\ 1 & 2 \end{pmatrix}$

C is the matrix $\begin{pmatrix} -1 & 0 & 4 \\ 3 & 1 & -2 \end{pmatrix}$ 　　**D** is the matrix $\begin{pmatrix} 3 & 0 & 4 \\ -2 & 1 & 0 \\ 2 & 3 & -1 \end{pmatrix}$

3. **BA** is the matrix

(a) $\begin{pmatrix} 7 & 15 \\ 14 & 30 \\ 4 & 9 \end{pmatrix}$ 　　　　(b) $\begin{pmatrix} 7 & 14 & 4 \\ 15 & 30 & 9 \end{pmatrix}$

(c) $\begin{pmatrix} 16 & 24 \\ 14 & 21 \end{pmatrix}$ 　　　　(d) Not defined

4. **AB** is the matrix

(a) $\begin{pmatrix} 7 & 15 \\ 14 & 30 \\ 4 & 9 \end{pmatrix}$ 　　　　(b) $\begin{pmatrix} 7 & 14 & 4 \\ 15 & 30 & 9 \end{pmatrix}$

(c) $\begin{pmatrix} 16 & 24 \\ 14 & 21 \end{pmatrix}$ 　　　　(d) Not defined

5. **CB** is the matrix

(a) $\begin{pmatrix} 7 & 3 & 14 \\ 14 & 6 & 28 \end{pmatrix}$

(b) $\begin{pmatrix} 7 & 3 & 14 \\ 14 & 6 & 28 \\ 5 & 2 & 8 \end{pmatrix}$

(c) $\begin{pmatrix} 2 & 5 \\ 8 & 11 \end{pmatrix}$

(d) Not defined

(e) I don't know

6. **CD** is the matrix

(a) $\begin{pmatrix} 13 & 2 & 2 \\ 1 & -5 & 11 \end{pmatrix}$

(b) $\begin{pmatrix} 5 & 12 & -8 \\ 3 & -5 & 14 \end{pmatrix}$

(c) $\begin{pmatrix} 5 & 3 \\ 12 & -5 \\ -8 & 14 \end{pmatrix}$

(d) $\begin{pmatrix} 13 & 1 \\ 2 & -5 \\ 2 & 11 \end{pmatrix}$

7. **DB** is the matrix

(a) $\begin{pmatrix} 10 & 0 & 15 \\ 17 & 0 & 22 \end{pmatrix}$

(b) $\begin{pmatrix} 0 & 7 & 7 \\ 1 & 12 & 10 \end{pmatrix}$

(c) $\begin{pmatrix} 10 & 17 \\ 0 & 0 \\ 15 & 22 \end{pmatrix}$

(d) $\begin{pmatrix} 0 & 1 \\ 7 & 12 \\ 7 & 10 \end{pmatrix}$

8. **A** is a 2×2 matrix, **B** is a 2×3 matrix and **C** is a 3×2 matrix.
   Which of the following calculations are possible?

   (i)   **BC** + **A**

   (ii)   **CA** + **B**

Solutions to section test

1. The matrix has 3 rows and 5 columns, so it is a 3×5 matrix.

2. $A + B = \begin{pmatrix} -1 & 2 \\ 1 & 3 \end{pmatrix} + \begin{pmatrix} 2 & 4 \\ 0 & -1 \end{pmatrix} = \begin{pmatrix} -1+2 & 2+4 \\ 1+0 & 3+-1 \end{pmatrix} = \begin{pmatrix} 1 & 6 \\ 1 & 2 \end{pmatrix}$

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

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

   $\qquad = \begin{pmatrix} -3 & 6 \\ 3 & 9 \end{pmatrix} - \begin{pmatrix} 4 & 8 \\ 0 & -2 \end{pmatrix}$

   $\qquad = \begin{pmatrix} -7 & -2 \\ 3 & 11 \end{pmatrix}$

3. $BA = \begin{pmatrix} 2 & 3 \\ 4 & 6 \\ 1 & 2 \end{pmatrix}\begin{pmatrix} 2 & 3 \\ 1 & 3 \end{pmatrix} = \begin{pmatrix} 7 & 15 \\ 14 & 30 \\ 4 & 9 \end{pmatrix}$

4. A is a 2×2 matrix, and B is a 3×2 matrix, so AB is not defined.

5. $CB = \begin{pmatrix} -1 & 0 & 4 \\ 3 & 1 & -2 \end{pmatrix}\begin{pmatrix} 2 & 3 \\ 4 & 6 \\ 1 & 2 \end{pmatrix} = \begin{pmatrix} 2 & 5 \\ 8 & 11 \end{pmatrix}$

6. $CD = \begin{pmatrix} -1 & 0 & 4 \\ 3 & 1 & -2 \end{pmatrix}\begin{pmatrix} 3 & 0 & 4 \\ -2 & 1 & 0 \\ 2 & 3 & -1 \end{pmatrix} = \begin{pmatrix} 5 & 12 & -8 \\ 3 & -5 & 14 \end{pmatrix}$

7. $DB = \begin{pmatrix} 3 & 0 & 4 \\ -2 & 1 & 0 \\ 2 & 3 & -1 \end{pmatrix} \begin{pmatrix} 2 & 3 \\ 4 & 6 \\ 1 & 2 \end{pmatrix} = \begin{pmatrix} 10 & 17 \\ 0 & 0 \\ 15 & 22 \end{pmatrix}$

8. (i) B is a 2×3 matrix and C is a 3×2 matrix, so BC exists and is a 2×2 matrix. A is also a 2×2 matrix, so A can be added to BC.

    (ii) C is a 3×2 matrix, and A is a 2×2 matrix, so CA exists and is a 3×2 matrix. B is a 2×3 matrix, so B cannot be added to CA.

    Only calculation (i) is possible.