

**Dr Oliver Mathematics**  
**Further Mathematics**  
*n × m* **Matrices**  
**Past Examination Questions**

This booklet consists of 3 questions across a variety of examination topics.  
The total number of marks available is 8.

1. Given that

$$\mathbf{A} = \begin{pmatrix} 3 & 1 & 3 \\ 4 & 5 & 5 \end{pmatrix} \text{ and } \mathbf{B} = \begin{pmatrix} 1 & 1 \\ 1 & 2 \\ 0 & -1 \end{pmatrix},$$

(2)

find  $\mathbf{AB}$ .

**Solution**

$$\mathbf{AB} = \begin{pmatrix} 3 & 1 & 3 \\ 4 & 5 & 5 \end{pmatrix} \begin{pmatrix} 1 & 1 \\ 1 & -2 \\ 0 & -1 \end{pmatrix} = \underline{\underline{\begin{pmatrix} 4 & 2 \\ 9 & 9 \end{pmatrix}}}.$$

2. Given that

$$\mathbf{C} = \begin{pmatrix} 2 \\ -3 \\ 4 \end{pmatrix}, \mathbf{D} = \begin{pmatrix} 2 & -1 & 5 \end{pmatrix}, \text{ and } \mathbf{E} = \mathbf{CD},$$

(2)

find  $\mathbf{E}$ .

**Solution**

$$\mathbf{E} = \underline{\underline{\begin{pmatrix} 4 & -2 & 10 \\ -6 & 3 & -15 \\ 8 & -4 & 20 \end{pmatrix}}}.$$

3. Given that

$$\mathbf{A} = \begin{pmatrix} 1 & 2 \\ 3 & -1 \\ 4 & 5 \end{pmatrix} \text{ and } \mathbf{B} = \begin{pmatrix} 2 & -1 & 4 \\ 1 & 3 & 1 \end{pmatrix},$$

(a) find  $\mathbf{AB}$ .

(3)

**Solution**

$$\mathbf{AB} = \begin{pmatrix} 1 & 2 \\ 3 & -1 \\ 4 & 5 \end{pmatrix} \begin{pmatrix} 2 & -1 & 4 \\ 1 & 3 & 1 \end{pmatrix} = \underline{\underline{\begin{pmatrix} 4 & 5 & 6 \\ 5 & -6 & 11 \\ 13 & 11 & 21 \end{pmatrix}}}.$$

(b) Explain why  $\mathbf{AB} \neq \mathbf{BA}$ .

(1)

**Solution**

$\mathbf{AB}$  is a  $3 \times 3$  matrix whereas  $\mathbf{BA}$  is a  $2 \times 2$  matrix:

$$\mathbf{BA} = \begin{pmatrix} 2 & -1 & 4 \\ 1 & 3 & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 3 & -1 \\ 4 & 5 \end{pmatrix} = \underline{\underline{\begin{pmatrix} 15 & 25 \\ 14 & 5 \end{pmatrix}}}.$$