

MATH110 — Assignment 1

Solutions

Question 1.

- (a) All have dimension 4 .
(b) $X_1 = 2$, $Y_3 = -1$ and Z_5 is not defined.
(c)

$$\mathbf{X} + \mathbf{Y} = \begin{bmatrix} 3 \\ 3 \\ -6 \\ -9 \end{bmatrix} \quad \text{and} \quad \mathbf{X} + \mathbf{Y} - \mathbf{Z} = \begin{bmatrix} 0 \\ 3 \\ -7 \\ -9 \end{bmatrix}.$$

(d)

$$3\mathbf{Y} + \mathbf{X} = \begin{bmatrix} 5 \\ 3 \\ -8 \\ -9 \end{bmatrix} \quad \text{and} \quad 3\mathbf{Y} - 2\mathbf{Z} = \begin{bmatrix} -3 \\ 0 \\ -5 \\ 0 \end{bmatrix}.$$

- (e) $\langle \mathbf{X}, \mathbf{Y} \rangle = 8$ and $\langle \mathbf{X} + \mathbf{Y} - \mathbf{Z}, 3\mathbf{Y} - 2\mathbf{Z} \rangle = 35$.

Question 2.

- (a) \mathbf{A} is 3×3 , \mathbf{B} is 3×3 , \mathbf{C} is 3×4 and \mathbf{D} is 4×1 .
(b) $A_{13} = 2$, $A_{31} = 0$ and $C_{24} = -1$. C_{42} is undefined.
(c)

$$3\mathbf{A} - 2\mathbf{B} = \begin{bmatrix} 5 & -4 & 6 \\ -3 & -4 & 14 \\ -2 & -3 & -2 \end{bmatrix}.$$

(d)

$$\mathbf{AB} = \begin{bmatrix} 1 & 2 & 2 \\ 5 & -2 & 4 \\ 0 & -2 & 1 \end{bmatrix}, \quad \mathbf{BA} = \begin{bmatrix} -3 & 0 & 6 \\ -2 & 1 & 8 \\ 1 & -1 & 2 \end{bmatrix}.$$

- (e) \mathbf{CB} is undefined.

$$\mathbf{BC} = \begin{bmatrix} -1 & 1 & 0 & -1 \\ 0 & 2 & -1 & -1 \\ 1 & 1 & 1 & -2 \end{bmatrix}.$$

Question 3.

- (a) Total sales = $\mathbf{A} + \mathbf{B}$

$$= \begin{bmatrix} 361 & 693 & 564 \\ 786 & 1272 & 1149 \end{bmatrix}.$$

(b)

$$\text{Average sales} = \frac{1}{2}(\mathbf{A} + \mathbf{B}) = \begin{bmatrix} 180.5 & 346.5 & 282 \\ 393 & 636 & 574.5 \end{bmatrix}.$$

(c)

$$\text{Profit} = \mathbf{BP} = \begin{bmatrix} 216 & 355 & 262 \\ 453 & 648 & 503 \end{bmatrix} \begin{bmatrix} 180 \\ 220 \\ 230 \end{bmatrix} = \begin{bmatrix} 177240 \\ 339790 \end{bmatrix}$$