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Problem Sheet 8 Matrices

Q1]

- $(A+B) = \begin{pmatrix} 7 & 8 \\ -4 & 0 \end{pmatrix}$
- $(2A+3B) = \begin{pmatrix} 18 & 19 \\ -13 & 2 \end{pmatrix}$

- $(A+2C)$ cannot be calculated
- $(4B-3A) = \begin{pmatrix} 7 & -3 \\ -23 & 14 \end{pmatrix}$
- $(C-\frac{1}{2}D) = \begin{pmatrix} -1/2 & -1 & 1 \\ 5/2 & -3/2 & -1 \\ 3 & 9/2 & 5 \end{pmatrix}$

Q2] $AB = \begin{pmatrix} 0 & 2 \\ 0 & 2 \\ 0 & 2 \end{pmatrix}$ $AC = \begin{pmatrix} 4 & 2 & 4 \\ 4 & 2 & 4 \\ 4 & 2 & 4 \end{pmatrix}$

$AD = \begin{pmatrix} 0 & 0 \\ 0 & 0 \\ 0 & 0 \end{pmatrix}$ $BC = \begin{pmatrix} 0 & 1 & -1 \\ 0 & 1 & -1 \end{pmatrix}$

$CA = \begin{pmatrix} 10 & 0 \\ 0 & 0 \end{pmatrix}$ $CD \Rightarrow$ cannot be found

Q3]

- $\begin{pmatrix} 19 & 22 \\ 43 & 50 \end{pmatrix}$
- $\begin{pmatrix} 3 & 4 \\ 6 & 8 \end{pmatrix}$
- $\begin{pmatrix} 23 & 34 \\ 31 & 46 \end{pmatrix}$
- (11)
- $\begin{pmatrix} 0 & 0 \\ 0 & 0 \end{pmatrix}$

Q4] $\begin{pmatrix} 1 & 1 & 1 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 1 \end{pmatrix}$

Q4) $\begin{pmatrix} 1 & 1 & 1 \\ 1 & -1 & 1 \end{pmatrix}\begin{pmatrix} x \\ y \\ z \end{pmatrix} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}$

Q5)
$$\begin{pmatrix} -1/10 & 3/10 \\ 2/5 & -1/5 \end{pmatrix}$$
$$\Rightarrow \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$$

Q6)
$$R_\theta \cdot R_\theta^{-1} = \begin{pmatrix} \cos^2\theta+\sin^2\theta & \cos\theta\sin\theta-\sin\theta\cos\theta & 0 \\ \cos\theta\sin\theta-\sin\theta\cos\theta & \cos^2\theta+\sin^2\theta & 0 \\ 0 & 0 & 1 \end{pmatrix}$$
$$= \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$

Q7)

(i) $R_{(-150)} \cdot M = \begin{pmatrix} \cos(-150) & -\sin(-150) & 0 \\ \sin(-150) & \cos(-150) & 0 \\ 0 & 0 & 1 \end{pmatrix} \cdot \begin{pmatrix} 15 & 40 & 40 & 15 \\ -10 & -10 & 20 & 20 \\ 1 & 1 & 1 & 1 \end{pmatrix}$

$$= \begin{pmatrix} -17.99 & -39.64 & -24.64 & -2.99 \\ 1.16 & -11.34 & -37.32 & -24.82 \\ 1 & 1 & 1 & 1 \end{pmatrix}$$

(ii) $R_{(150)} \cdot M = \begin{pmatrix} \cos(150) & -\sin(150) & 0 \\ \sin(150) & \cos(150) & 0 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} 15 & 40 & 40 & 15 \\ -10 & -10 & 20 & 20 \\ 1 & 1 & 1 & 1 \end{pmatrix}$

$$= \begin{pmatrix} -7.99 & -29.64 & -44.64 & 2.99 \\ 16.16 & 28.66 & 2.68 & -9.82 \\ 1 & 1 & 1 & 1 \end{pmatrix}$$

(iii) $R_{(-225)} \cdot M = \begin{pmatrix} \cos(-225) & -\sin(-225) & 0 \\ \sin(-225) & \cos(-225) & 0 \\ 0 & 0 & 1 \end{pmatrix}\begin{pmatrix} 15 & 40 & 40 & 15 \\ -10 & -10 & 20 & 20 \\ 1 & 1 & 1 & 1 \end{pmatrix}$

$$= \begin{pmatrix} -3.535 & -21.21 & -42.42 & -24.745 \\ 17.675 & 35.35 & 14.14 & -3.535 \end{pmatrix}$$