

3x3 Matrix Transformations Exam Questions

Q1, (OCR MEI Y410, Practice Paper Set 1, Q5)

- (i) Write down the 3×3 matrix \mathbf{M}_1 that represents a reflection in the plane $y = 0$. [1]
- (ii) Write down the single transformation represented by the matrix $\mathbf{M}_2 = \begin{pmatrix} 1 & 0 & 0 \\ 0 & -1 & 0 \\ 0 & 0 & -1 \end{pmatrix}$. [1]
- (iii) (A) Find the determinants of \mathbf{M}_1 and \mathbf{M}_2 . [2]
- (B) Explain how the signs and magnitudes of these determinants relate to the transformations represented by the matrices \mathbf{M}_1 and \mathbf{M}_2 . [2]
- (iv) (A) Find the matrix \mathbf{M}_3 where $\mathbf{M}_3 = \mathbf{M}_1\mathbf{M}_2$. [1]
- (B) Describe the single transformation represented by the matrix \mathbf{M}_3 . [2]
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Q2, (OCR Y531/01, Practice Paper Set 2, Q5)

The matrix \mathbf{A} is given by $\begin{pmatrix} 1 & 0 & 0 \\ 0 & a^2 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ and the matrix \mathbf{B} is given by $\begin{pmatrix} 0.6 & b & 0 \\ -b & 0.6 & 0 \\ 0 & 0 & 1 \end{pmatrix}$.

- (i) \mathbf{A} represents a reflection. Write down the value of $\det \mathbf{A}$. [1]
- (ii) Hence find the possible values of a . [2]
- (iii) \mathbf{r} is the position vector of a point R . Given that $\mathbf{A}\mathbf{r} = \mathbf{r}$ describe the location of R . [1]
- (iv) \mathbf{B} represents a rotation. Write down the value of $\det \mathbf{B}$. [1]
- (v) Hence find the possible values of b . [2]
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