6. **In this question you must show all stages of your working.**
Solutions relying on calculator technology are not acceptable.

The matrix **M** is given by

$$\begin{pmatrix} -2 & 2 & 2 \\ -3 & -7 & -3 \\ 1 & 1 & -3 \end{pmatrix}$$

(a) Show that $\begin{pmatrix} 1 \\ 0 \\ -1 \end{pmatrix}$ is an eigenvector of **M**, stating the corresponding eigenvalue.

(3)

(b) Show that the eigenvalue from part (a) is the only eigenvalue of **M**.

(4)

The transformation $M : \mathbb{R}^3 \to \mathbb{R}^3$ is represented by the matrix **M**.

(c) Determine a Cartesian equation for the image under M of the line with equation

$$x - 1 = \frac{y+1}{2} = \frac{z}{-3}$$

(4)

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Question 6 continued

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Question 6 continued

(Total for Question 6 is 11 marks)