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

$$\mathbf{M} = \begin{pmatrix} -5 & 3 \\ 3 & 3 \end{pmatrix}$$

(a) Determine the eigenvalues of matrix **M**

**(3)**

(b) Determine a normalised eigenvector for each eigenvalue of **M**

**(3)**

(c) Hence write down a diagonal matrix **D** and an orthogonal matrix **P** such that

$$\mathbf{D} = \mathbf{P}^{\mathrm{T}}\mathbf{M}\mathbf{P}$$

**(2)**

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

**Question 1 continued**

**Question 1 continued**

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

**Question 1 continued**

**(Total for Question 1 is 8 marks)**