3: $\mathbf{M} = \begin{pmatrix} 1 & -1 & 4 \\ 3 & a & b \\ a & 1 & b \end{pmatrix}$ where a and b are constants

Given that $\mathbf{i} + 2\mathbf{j} + \mathbf{k}$ is an eigenvector of $\mathbf{M}$,

(a) determine the corresponding eigenvalue.

(2)

(b) Hence determine the value of a and the value of b.

(2)

(c) Determine

(i) the other eigenvalues of $\mathbf{M}$,

(3)

(ii) eigenvectors which correspond to these eigenvalues.

(3)

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Question 3 continued

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Question 3 continued

(Total for Question 3 is 10 marks)