4.

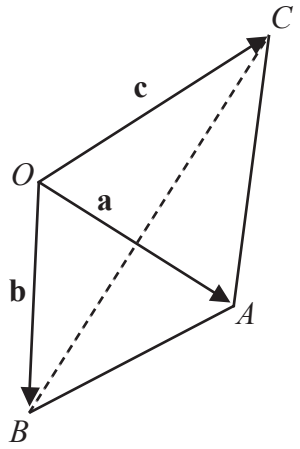


Figure 1

The points A, B and C have position vectors $\mathbf{a}$, $\mathbf{b}$ and $\mathbf{c}$ respectively, relative to a fixed origin O, as shown in Figure 1, where

$$\mathbf{a} = 2\mathbf{i} - \mathbf{k} \qquad \mathbf{b} = \mathbf{i} + 2\mathbf{j} - 2\mathbf{k} \qquad \text{and} \qquad \mathbf{c} = 3\mathbf{i} + \mathbf{j} + \mathbf{k}$$

Determine

(a) $\mathbf{b} \times \mathbf{c}$

(2)

(b) $\mathbf{a} \bullet (\mathbf{b} \times \mathbf{c})$

(2)

(c) the volume of the tetrahedron $OABC$

(1)

(d) the shortest distance from A to the plane containing O, B and C, giving the answer as a simplified surd.

(3)

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Question 4 continued

(Total for Question 4 is 8 marks)