5. Relative to a fixed origin O,

- the point A has position vector $5\mathbf{i} + 3\mathbf{j} - 2\mathbf{k}$
- the point B has position vector $7\mathbf{i} + \mathbf{j} + 2\mathbf{k}$
- the point C has position vector $4\mathbf{i} + 8\mathbf{j} - 3\mathbf{k}$

(a) Find $|\overrightarrow{AB}|$ giving your answer as a simplified surd.

(2)

Given that $ABCD$ is a parallelogram,

(b) find the position vector of the point D.

(2)

The point E is positioned such that

- ACE is a straight line
- $AC : CE = 2 : 1$

(c) Find the coordinates of the point E.

(2)