3. The lines L_1 and L_2 have equations given by

$$L_1: \quad \mathbf{r} = \begin{pmatrix} -7 \\ 7 \\ 1 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ 0 \\ -3 \end{pmatrix} \quad \text{and} \quad L_2: \quad \mathbf{r} = \begin{pmatrix} 7 \\ p \\ -6 \end{pmatrix} + \mu \begin{pmatrix} 10 \\ -4 \\ -1 \end{pmatrix}$$

where λ and μ are parameters and p is a constant.

The two lines intersect at the point C.

(a) Find

(i) the value of p,

(ii) the position vector of C.

(5)

(b) Show that the point B with position vector $\begin{pmatrix} -13 \\ 11 \\ -4 \end{pmatrix}$ lies on L_2.

(1)

The point A with position vector $\begin{pmatrix} -7 \\ 7 \\ 1 \end{pmatrix}$ lies on L_1.

(c) Find $\cos(\angle ACB)$, giving your answer as an exact fraction.

(3)

The line L_3 bisects the angle ACB.

(d) Find a vector equation of L_3.

(4)