5. The line l_1 has equation

$$\mathbf{r} = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix} + \lambda \begin{pmatrix} 1 \\ 4 \\ 2 \end{pmatrix}$$ where λ is a scalar parameter

The line l_2 has equation

$$\mathbf{r} = \begin{pmatrix} -1 \\ \beta \\ 6 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ -1 \\ 7 \end{pmatrix}$$ where β is a constant and μ is a scalar parameter

Given that l_1 and l_2 intersect at the point P

(i) find the value of β

(ii) find the coordinates of P

(6)

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Question 5 continued

(Total for Question 5 is 6 marks)

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

Use the substitution $u = 3 + \cos\theta$ to show that

$$\int_0^{\frac{\pi}{2}} \frac{\sin 2\theta}{\sqrt{3 + \cos\theta}} \, \mathrm{d}\theta = a\sqrt{3} + b$$

where a and b are constants to be found.

(7)

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