C4 Review 2

1. The position vectors of A and B with respect to 0 are $\begin{pmatrix}6\\2\\2\end{pmatrix}$ *and* $\begin{pmatrix}2\\4\\3\end{pmatrix}$ respectively. The points C and D are such that $\vec{OC}=\frac{3}{2}\vec{OA}$ and $\vec{OD}=2\vec{OB}$.

(i) State the position vectors of C and D

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(ii) The line through A and D is denoted by l_1 and the line through B and C is denoted by l_2. Show that equation l_1 has equation

$$r = \begin{pmatrix}6\\2\\2\end{pmatrix} + \lambda\begin{pmatrix}-2\\6\\4\end{pmatrix}$$

And find an equation for l_2 in a similar form.

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(iii) The lines l_1 and l_2 intersect at X. Find the position vector X

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(iv) Calculate the acute angle between l_1 and l_2 correct to the nearest degree.

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2. Find the independent term in x in the expansion of $\left(\frac{3}{x^4} - x\right)^5$

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3. Use the substitution $u = 2x - 3$ to find the exact value of

$$\int_2^3 \frac{4x}{(2x-3)^4}\,dx$$

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Answers

1. (i) $\begin{pmatrix}9\\3\\3\end{pmatrix}$ and $\begin{pmatrix}4\\8\\6\end{pmatrix}$

(ii) $l_2 = \begin{pmatrix}2\\4\\3\end{pmatrix} + \mu\begin{pmatrix}7\\-1\\0\end{pmatrix}$ (direction vector calculated)

(iii) $\vec{OX} = \begin{pmatrix}5.5\\3.5\\3\end{pmatrix}$ (iv) 68° (scalar product seen)

2. $\left(\frac{3}{x^4}\right)^5\left(1+\frac{x^5}{3}\right)^5$ seen . Independent term is 15

3. $1\frac{11}{27}$