MT1612: EXAMPLE SHEET[1] VII (for May 5, 1999)

1.) Given the vectors $\mathbf{a} = (1, 2, 3)$, $\mathbf{b} = (3, 2, 1)$ and $\mathbf{c} = (1, 1, 2)$ find

- **(i)** the angle between $\mathbf{a}$ and $\mathbf{b}$.
- **(ii)** the area of the parallelogram spanned by $\mathbf{a}$ and $\mathbf{b}$.
- **(iii)** a unit normal to $\mathbf{a}$ and $\mathbf{b}$.
- **(iv)** the volume of the cuboid spanned by $\mathbf{a}, \mathbf{b}$ and $\mathbf{c}$.
- **(v)** Do the vectors $\mathbf{a}, \mathbf{b}$ and $\mathbf{c}$ form a right handed system?

2.) The position vectors of the four points A, B, C and D are given by $\mathbf{a} = (1, 1, 1)$, $\mathbf{b} = (3, 4, 5)$, $\mathbf{c} = (2, 1, 9)$ and $\mathbf{d} = (5, 7, 9)$, respectively.

- **(i)** Write down the vector equations of the lines $\mathbf{l}_1$ and $\mathbf{l}_2$ through AB and CD, respectively.
- **(ii)** Do the two lines intersect the plane $z = 0$ and, if so, at what points?
- **(iii)** Do the lines intersect each other and, if so, where?

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