

Geometry & Vectors

Coursework 2

(Hand in the solutions to all questions by Tuesday 15/04/08 16:00)

1) (15 marks)

Given the four points $A(1, -1, 0)$, $B(4, 5, 1)$, $C(6, 0, 3)$, $D(4, 2, 1)$

- i) find the equations of the lines passing through A, B and C, D in Cartesian form;
- ii) determine the point of intersection of the line \overleftrightarrow{AB} with the xy -plane and the point of intersection of the line \overleftrightarrow{CD} with the yz -plane;
- iii) find the coordinates of the points in which the lines \overleftrightarrow{AB} and \overleftrightarrow{CD} intersect the plane

$$\mathcal{P} : 3x - 4y + z = 21.$$

2) (15 marks)

$ABCD$ constitutes a parallelogram. The point W is the midpoint of the line segment BC . The lines \overleftrightarrow{AW} and \overleftrightarrow{BD} intersect in the point X .

- i) Sketch the corresponding figure.
- ii) State the similarity axiom.
- iii) Use the similarity axiom to show that

$$DX : XB = 2 : 1.$$

3) (10 marks)

Determine the equation of the line of intersection of the planes

$$\begin{aligned}\mathcal{P}_1 & : x - 4y + 9z = 1 \\ \mathcal{P}_2 & : 2x + 3y - 5z = 2\end{aligned}$$

in Cartesian form.

4) (10 marks)

Given the three points $A(5, -1, 1)$, $B(-7, 2, 0)$ and $C(-1, 1, -1)$, find the equation of the plane containing these three points. Is this plane unique?