

## Geometry and Vectors

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### Coursework 2

Hand in the complete solutions to all three questions in the general office (room C123)

DEADLINE: Thursday 02/04/2009 at 16:00

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1. (12 marks) Given the two points  $A(6, 1, 3)$  and  $B(4, 5, 1)$ ,
- (i) find the equation of the line passing through  $A$  and  $B$  by determining the point of intersection of this line with the  $yz$ -plane;
  - (ii) find the coordinates of the point in which the line through the points  $A$  and  $B$  intersects the plane

$$\mathcal{P} : 2x + y - 3z = 16.$$

2. (12 marks) A circle with radius 2 and center located on the  $y$ -axis is inscribed into the parabola  $y = x^2/2$ . (This means the circle and the parabola have the same tangent at the points of intersection.)
- (i) Draw the corresponding figure.
  - (ii) Determine the points of intersection, the center of the circle and the intersection of the circle with the  $y$ -axis.

3. (26 marks) Given are the three points  $A(0, 3, 1)$ ,  $B(2, 4, 0)$  and  $C(3, 5, 5)$  and the two lines

$$\mathcal{L}_1 : \frac{x+1}{2} = y-1 = \frac{z-2}{3}$$

$$\mathcal{L}_2 : -x = \frac{y+9}{3} = z+4.$$

- (i) Do the two lines  $\mathcal{L}_1$  and  $\mathcal{L}_2$  intersect? In case they do, find the coordinates of their point of intersection  $P = \mathcal{L}_1 \cap \mathcal{L}_2$ .
- (ii) Determine the equation of the plane  $\mathcal{P}_1$  containing  $\mathcal{L}_1$  and  $\mathcal{L}_2$ , i.e.  $\mathcal{L}_1 \in \mathcal{P}_1$ ,  $\mathcal{L}_2 \in \mathcal{P}_1$ .
- (iii) Determine the equation of the plane  $\mathcal{P}_2$  which contains the points  $A, B$  and  $C$ .
- (iv) Compute the equation for the line of intersection for the two planes  $\mathcal{P}_1$  and  $\mathcal{P}_2$  in Cartesian form.