Homework 2

Due on 18 July, 2013

You may solve any 4 of the 5 questions below correctly for full credit. But you are strongly encouraged to attempt all problems.

1

i) Find the acute angle between the lines 3x + y = 5, 2x - y = 4.

ii) Find a vector which is perpendicular to the line 4x + 2y = 10.

Explain your answers.

$\mathbf{2}$

Let A(1,0,-1), B(1,7,2), C(2,4,-1), D(0,3,2) be four points in \mathbb{R}^3 .

- i) Prove that these four points are vertices of a parallelogram.
- ii) Find the area of the parallelogram.
- iii) Find the equation of the plane which contains the parallelogram.

3

- i) Find the distance of the point (0, 0, 12) from the line given by x = 4t, y = -2t, z = 2t.
- ii) Find the distance of the point (2, -3, 4) from the plane given by x + 2y + 2z = 13.

4

- i) Find the point of intersection of the line x = 1 + 2t, y = 1 + 5t, z = 3t with the plane x + y + z = 2.
- ii) Find a parametrization for the line in which the planes x + y + z = 1 and x + y = 2 intersect.

- i) Find the coordinates of the foci of the ellipse given by $4x^2 + y^2 + 8x 2y = -1$. Also compute the area enclosed by the ellipse.
- ii) Compute the volume of the ellipsoid $x^2 + \frac{y^2}{4} + \frac{z^2}{9} = 1$ by integrating the area of slices parallel to xy-plane.

Hint : Area of ellipse = πab , where a and b denote the semi-major and semiminor axes respectively.

 $\mathbf{5}$