MTH4103 (2013–14)

Geometry I

Learning Outcomes **Winter/Spring 2014**

The learning outcomes for this course are:

- convert between vector and cartesian equations of a straight line in $\mathbb{R}^2$ or $\mathbb{R}^3$.

- write equation of a line in $\mathbb{R}^2$ or $\mathbb{R}^3$ passing through given points, or passing through a point and orthogonal to a line/plane.

- use scalar product to calculate length of vector and cosine of angle between two vectors.

- form sums of vectors; in $\mathbb{R}^3$ form vector product of two vectors.

- calculate volume of parallelepiped by determinant.

- find all solutions of a set of linear equations in two or three variables, by reduction to echelon form.

- multiply two 2×2 or 3×3 matrices over $\mathbb{R}$.

- for a 2×2 or 3×3 matrix over $\mathbb{R}$, determine invertibility by determinant, and if invertible, calculate the inverse.

- calculate the determinant and (if invertible) the inverse of a 2×2 or 3×3 matrix over $\mathbb{R}$.

- calculate characteristic equation, eigenvalues and eigenvectors of a 2×2 or 3×3 matrix over $\mathbb{R}$.

- recognise from its matrix a rotation, a reflection, a dilation and a shear in $\mathbb{R}^2$ and $\mathbb{R}^3$.

- compute $\sin(a + b)$ and $\cos(a + b)$ by taking product of rotation matrices.

The examination be similar in style to previous years and contain approximately EIGHT questions, all of which will be compulsory. (The exact number of questions is subject to variation.) Also note that calculators are NOT permitted in either the main examination or the in-term test.

<div align="right">

Dr John N. Bray
6th January 2014

</div>