

MA 243 HOMEWORK 6

DUE: THURSDAY, NOVEMBER 15, 2007, BY 12PM

Hand in the problems in Section B *only* to the boxes outside the undergraduate office. You are encouraged to work together on the problems, but your written work should be your own.

A : WARM-UP PROBLEMS

- (1) Write a list summarizing in just one or two sentences the content of each lecture so far.

B: EXERCISES

- (1) Write a short (one or two pages) study guide to the first half of this module. What were the key ideas/definitions/theorems of each week?
- (2) Recall that $\mathbb{H}^1 = \{(t, x) \in \mathbb{R}^2 : -t^2 + x^2 = -1\}$. Show that the map $\phi : \mathbb{R} \rightarrow \mathbb{H}^1$ given by $\phi(s) = (\cosh(s), \sinh(s))$ is a bijection.
- (3) Show that if $T(x) = Ax$ is a linear map from \mathbb{R}^2 to itself (so A is a 2×2 matrix) with the property that T maps \mathbb{H}^1 to itself and preserves distance, then A has one of the following two forms:

$$A = \begin{pmatrix} \cosh(s) & \sinh(s) \\ \sinh(s) & \cosh(s) \end{pmatrix}, \quad A = \begin{pmatrix} \cosh(s) & -\sinh(s) \\ \sinh(s) & -\cosh(s) \end{pmatrix}$$

- (4) Show that if L is a hyperbolic line then there is a distance preserving bijection from L to \mathbb{H}^1 .

C: EXTENSIONS

- (1) Do any (all!) of the exercises on the sphere in Chapter 3 of the book.