

MTH 675 – ASSIGNMENT 4

Due: 11/17/2008 (**Monday**)

1. Do Carmo, p. 46: 4b. (Hint: Work with the generators of $PSL(2, \mathbb{R})$.)
2. Consider the upper half plane $G = \{(x, y) : y > 0\}$ with the Lobatchevsky metric $g = \frac{dx^2 + dy^2}{y^2}$.

(a) Show that a vertical line is a geodesic.

(b) Show that the isometries of G ,

$$z \mapsto \frac{az + b}{cz + d}, \quad ad - bc = 1,$$

take vertical lines to all upper semi-circles orthogonal to the x -axis at both ends. Hence these are also geodesics.

(c) Show that types 1 and 2 include all geodesics of G .

3. DoCarmo, p. 56: 2.

4. DoCarmo, p. 77: 1.