Math 443 **Differential Geometry** **Spring 2011**

Assignment #4: Due 4/29/11

MIDTERM EXAM: Wednesday, May 4, in class.

Reading:

- 4.6 (except pp. 191–192), and 4.9. (We are skipping 4.7 and 4.8, and also the last part of 4.5, starting right after Exercise 4.22.)

Written Assignment:

A. Exercise 4.22 (p. 182). (For this exercise, assume as Bär does that a surface of revolution is given by a single parametrization.)

B. Exercise 4.30 (p. 202).

C. Let a be a positive constant, and let $S \subset \mathbb{R}^3$ be the cylinder defined by $x^2 + y^2 = a^2$, with the first fundamental form.

(a) Find all the geodesics in S. [Hint: use Exercise 4.18.]

(b) Let p be the point $(a, 0, 0) \in S$. Choose an orthonormal basis for T_pS, and compute explicit formulas for the Riemannian normal coordinate parametrization and the geodesic polar coordinate parametrization associated with the chosen frame.

(c) What is the size of the largest open disk centered at the origin in $\mathbb{R}^2$ on which a Riemannian normal coordinate parametrization can be defined?