

Differential Geometry  
Homework  
Feb 9, 2005.

1. Prove that

$$D^2 = \{x \in \mathbb{R}^2 \mid \|x\| < 1\}$$

is an open set in  $\mathbb{R}^2$ .

2. Prove that a plane in  $\mathbb{R}^3$  is a smooth surface with 1 patch.
3. Find the formulas for the stereographic projections from the sphere  $x^2 + y^2 + z^2 = 1$  to the planes  $z = 1$  and  $z = -1$ .