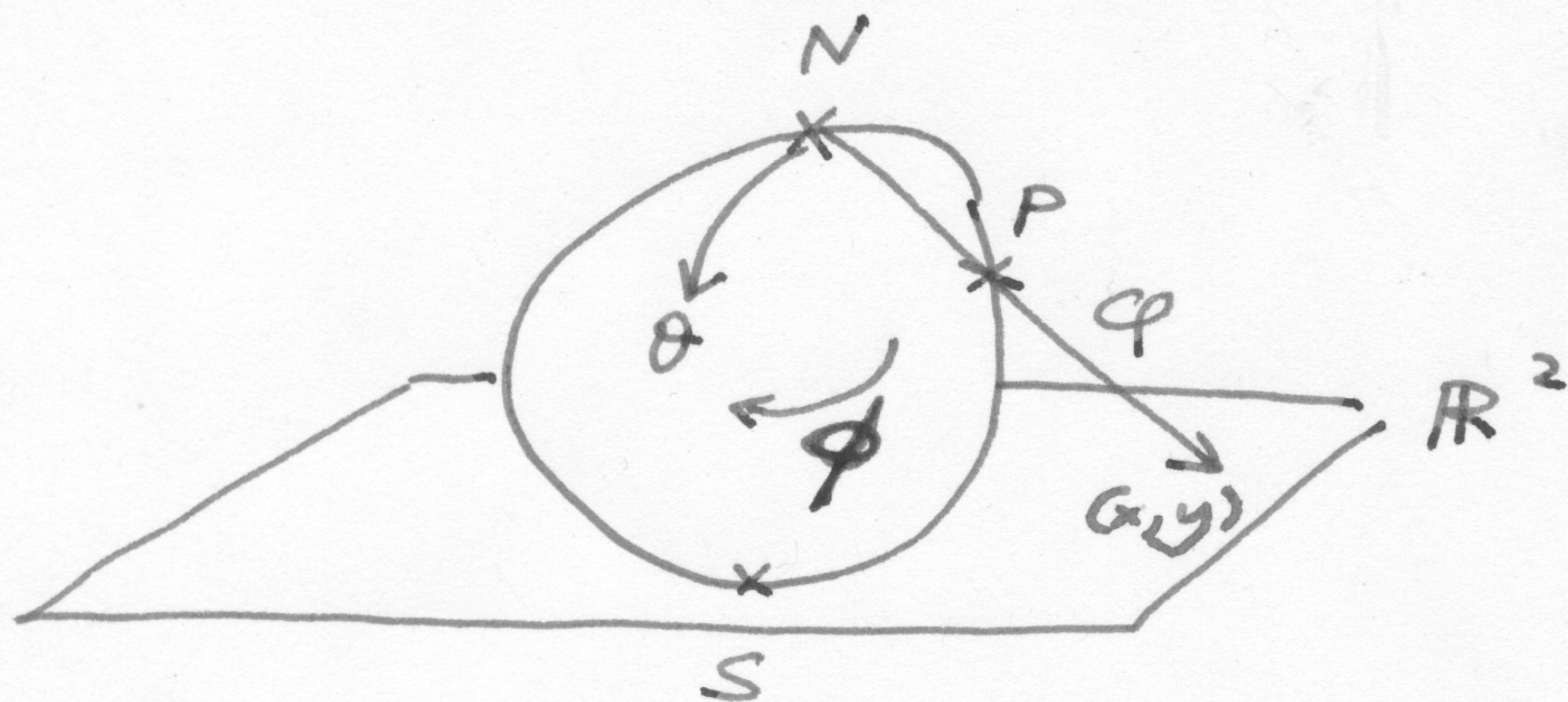


Homework 1

Consider the sphere S^2



with the usual spherical coordinates (θ, ϕ) and stereographic coordinates (x, y) as depicted ($\varphi: P \in S^2 \mapsto (x, y) \in \mathbb{R}^2$ by sighting the north pole through P).

- 1) Compute the change of coordinate map between these two charts
- 2) Express the vector fields $\frac{\partial}{\partial x}$ and $\frac{\partial}{\partial y}$ in spherical coordinates
- 3) Compute the canonical sphere metric $ds^2 = d\theta^2 + \sin^2\theta d\phi^2$ in stereographic coordinates.

How is it related to the cartesian metric $ds^2 = dx^2 + dy^2$? Comment.