General Relativity HW 5 Quiz   Name_____

You know the drill!

1. (*10pts*) Prolate spheroidal coordinates are related to the usual Cartesian coordinates $\{x, y, x\}$ of Euclidean three-space by

$$x = sinh\chi \, sin\theta \, cos\phi$$
$$y = sinh\chi \, sin\theta \, sin\phi$$
$$z = cosh\chi \, cos\theta$$

What does the invariant interval ds^2 look like in prolate spheroidal coordinates when $\theta = \frac{\pi}{2}$?

2. (*10pts*) Consider the open annulus which is the set of points in $\mathbb{R}^2$ such that $a < r < b$, when $\mathbb{R}^2$ is described in terms of polar coordinates (r, θ). Show that this space is a manifold that can be covered by a single chart. In your answer make sure you provide the explicit chart map.