Riemannian Geometry

Hints 1

1. (*) Consider a "product atlas" (the charts for $M \times N$ being the products of the charts for M and N). Express the coordinate changes for $M \times N$ through the coordinate changes for M and N. Check the Hausdorff property.

2. Use the existence of a smooth atlas on M. Cover each point of M by a preimage of some (possibly, small) ball. Map the balls to unit balls and use the composition functions to construct the required atlas.

3. Look at the point $(0, 0)$.

4. Use the implicit function theorem (show that $a \neq 0$ is regular value of xyz). What happens at $a = 0$?

5. Almost no extra hints.

   (c) Apply implicit function theorem to the function $f(A) = \det A$.