1. Prove the Levi-Civita connection is unique.

2. Explain carefully why
\[ \nabla_{\dot{\gamma}} \dot{\gamma} = [\dot{\gamma}^k + \Gamma^k_{ij} \dot{\gamma}^i \dot{\gamma}^j] \partial_k. \]

3. Using your favorite method (spherical coordinates, stereographic projection, you name it) write down Christoffel symbols for the round sphere in \( \mathbb{R}^3 \). Use this to write down and solve the geodesic equation and show that the solutions are great circles.