1. Let $M \subset \mathbb{R}^3$ be a compact, orientable, embedded 2-manifold with the induced metric.

   (a) Show that $M$ cannot have $K \leq 0$ everywhere (\textbf{Hint:} look at a point where the distance from the origin takes a maximum.)

   (b) Show that $M$ cannot have $K \geq 0$ everywhere unless $\chi(M) > 0$.

2. If $M$ is an oriented surface with Riemannian metric, $g$, and the Gaussian curvature is nonpositive. Prove there are no geodesic polygons with 1 or 2 vertices. Give examples of surfaces with geodesic polygons having 1 or 2 vertices if the Gaussian curvature is positive.

3. A \textit{geodesic triangle} on a Riemannian 2-manifold $(M, g)$ is a three-sided geodesic polygon. Prove that if $M$ has constant Gaussian curvature $K$, show that the sum of the interior angles of a geodesic triangle $\gamma$ is equal to $\pi + KA$, where $A$ is the area of the region bounded by $\gamma$. 