1 For a surface parametrized by $\mathbf{x} = \mathbf{x}(u^i)$, if $g_{11} = 1, g_{12} = g_{21} = 0$ and $g_{22} = f(u^2) > 0$, find the system of ODEs of geodesics $\mathbf{x}(s) = \mathbf{x}(u^i(s))$.

2 Prove that a curve of constant geodesic curvature on a sphere is a circle.

3 Prove that the meridians of a surface of revolution are geodesics.

4 Prove that if a surface contains a straight line, that straight line is a geodesic on the surface.

5 Show that the torsion $\tau = \tau(s)$ of a geodesic $\mathbf{x} = \mathbf{x}(s)$ on a surface can be expressed as $\dot{\mathbf{x}}(s) \cdot \mathbf{N}(s) \times \dot{\mathbf{N}}(s)$, where $\mathbf{N}(s)$ is the restriction of the normal vector of the surface on the geodesic.