Exercise sheet 6

Curves and Surfaces, MTH201

1. Consider any surface $S \subset \mathbb{R}^3$, let $f : S \to \mathbb{R}$, $f(x, y, z) = x$. Show that this is a smooth function.
2. Consider a surface $S \subset \mathbb{R}^3$, let $f : S \to P$, where $f(x, y, z) = (x, y, 0)$ and P is the plane defined by $z = 0$. Show that this is a smooth function.
3. Give a surface patch for a sphere. Compute the first fundamental form using the surface patch.
4. Give a surface patch for a plane. Compute the first fundamental form using the surface patch.
5. How does the matrix associated with the first fundamental form change under a coordinate transformation?