1. Let a unit circle $C$ roll on the $x$-axis from left to right. Find a parametrization for the trajectory followed by any arbitrary point $P \in C$ during this motion.

2. Find a parametric representation for a “circular doughnut” (torus).

3. Give concrete examples for all possible ways an immersion can fail to be an embedding.

4. Let $M_m \subset \mathbb{R}^n$ be an $m$-dimensional $C^1$-manifold. Show that the tangent space to $M_m$ at any point $x \in M_m$ does not depend on the choice of local representation (parametrization) $g$ for the manifold.

5. Prove that the unit sphere
   \[ S^{n-1} = \{ x \in \mathbb{R}^n \mid |x|_2 = 1 \} \]
   is a $(n-1)$-dimensional $C^1$-manifold in $\mathbb{R}^n$. Characterize its tangent space at every point.