ASSIGNMENT 1

Due date Monday 29th of September 2025.

(1) Chapter 1 of Lee, Problem 7
(2) Use the chain rule to show that if $\phi : \mathbb{R}^m \to \mathbb{R}^n$ is a diffeomorphism, then $m = n$. Hence show that diffeomorphic manifolds have the same dimension.
(3) In class, we have described the torus and real projective plane in terms of a square fundamental domain, with opposite pairs of edges glued. Find an explicit smooth atlas for the torus and the real projective plane.
(4) Chapter 2 of Lee, Problem 2.8. Only do the first part with $\mathbb{R}P^n$.
(5) Chapter 2 of Lee, Problem 2.1