MATH 561, FALL 2022–PROBLEM SET 2 (due Tuesday 9/20)

Problem 1. [Munkres EDT, Problem 1.10 p.11] If $f : M \to N$ is a C^r diffeomorphism, then f^{-1} is a C^r diffeomorphism. (Follow the steps indicated in the book to prove the result in euclidean space, then explain why this implies the result for maps of manifolds.)

Problem 2. (i) Show that a continuous proper map $f : M \to N$ (differentiable manifolds) is a closed map; use this to prove that an injective proper immersion $f : M \to N$ is an embedding.

(ii) Show that if M is compact, any injective proper immersion $f : M \to N$ is an embedding.

Problem 3. Let M be a C^r manifold ($r \geq 2$), TM its tangent bundle. Show that the differential of the identity map of M is the identity map of TM.