1. Let \( F(x, y) = (x^2 - y^2, xy) \).

a. Compute \( DF \), and observe that it is nonsingular on \( \mathbb{R}^2 \setminus \{0\} \).

b. Show that \( F \) is two-to-one on \( \mathbb{R}^2 \setminus \{0\} \), and one-to-one on \( H = \{(x, y) : x > 0\} \).

c. Compute the inverse of \( F|_H \). Verify directly that \( F(H) \) is open (probably easiest to just find \( F(H) \)) and that \( D[(F|_H)^{-1}](F(x, y)) = DF(x, y)^{-1} \) for all \( (x, y) \in H \).

d. Prove that \( F \) is an open map. (Warning: Something special must be done near 0.)

2. In class, we used the inverse function theorem to prove the implicit function theorem. Do the reverse. Use the implicit function theorem to prove the inverse function theorem.

3. Let \( E \) be an open subset of \( \mathbb{R}^n \). Let \( f : E \to \mathbb{R} \), and assume that all first order partials of \( f \) exist and are bounded throughout \( E \). Prove that \( f \) is continuous.

4. Exercise 15 in Chapter 9 of Rudin.

5. Exercise 17 in Chapter 9 of Rudin.