Reading. §2.10, §§3.1–3.3.

Problems from the book: the starred problems may be carefully graded. You will be given a “completeness” score, depending on how carefully you complete these problems.

- §2.10: 1abc, 2, 3, 8, 9, 13, 16*
- §3.1: 1, 2, 8*, 9, 19
- §3.2: 1, 4*, 5, 6*

Additional problems: These will be carefully graded!

1. Let \( f : \mathbb{R}^2 \to \mathbb{R}^2 \) be defined by
   \[
   f(x, y) = (x^2 - y^2, 2xy).
   \]
   a. Show that \( f \) is one-to-one on the set \( A \) consisting of all \( (x, y) \) with \( x > 0 \).
      [HINT: If \( f(x, y) = f(a, b) \), then \(|f(x, y)| = |f(a, b)|\).
   b. What is the image \( B = f(A) \)?
   c. If \( g \) is the inverse function, find \( Dg \left( \begin{array}{c} 0 \\ 1 \end{array} \right) \).

2. Let \( f : \mathbb{R}^n \to \mathbb{R}^n \) be given by the equation \( f(x) = |x|^2 \cdot x \). Show that \( f \) is differentiable and that \( f \) carries the unit ball centered at \( \vec{0} \) to itself in a one-to-one fashion. Show, however, that the inverse function is not differentiable at \( \vec{0} \).