

## 18.950/9501 (S20): HOMEWORK 2

The book references are to do Carmo, *Differential Geometry of Curves and Surfaces*. (The numbers for the assigned problems are the same in both editions of the book.)

**Due:** Thursday, Feb 20, in class.<sup>1</sup>

**Exercise 1.** Chapter 2–2, Problem 16.

**Exercise 2.** Chapter 2–2, Problem 18.

**Exercise 3.** Chapter 2–3, Problem 6. (Do Carmo uses ‘differentiable’, we use ‘smooth’.)

**Exercise 4.** Chapter 2–3, Problem 16.

**Exercise 5.** Prove that  $\bar{\mathbb{D}} = \{(x, y, z) \in \mathbb{R}^3 : x^2 + y^2 \leq 1, z = 0\}$  is *not* a regular surface.

**Exercise 6.** Denote by  $\mathbb{S}^2 = \{(x, y, z) \in \mathbb{R}^3 : x^2 + y^2 + z^2 = 1\}$  the unit sphere. Show that the map  $\phi: \mathbb{S}^2 \rightarrow \mathbb{S}^2$ ,  $(x, y, z) \mapsto (-x, -y, -z)$ , is a diffeomorphism.

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*Date:* February 13, 2020.

<sup>1</sup>See the course website, <https://math.mit.edu/~phintz/18.950-S20/>, for homework policies.