MAT4510, Fall 2023

Problems for Wednesday the 30th August

Problem 1

Bär, Exercise 3.4 on page 92.

Problem 2

Let
$$U = \{(u, v, t) \in \mathbb{R}^3 \mid u^2 + v^2 < 1\}$$
and define the function $f : U \to \mathbb{R}$ by

$$f(u, v, t) = u \sin t - v \cos t.$$

(i) Show that $\Sigma = f^{-1}(0)$ is a regular surface.

(ii) Show that the map $h : \mathbb{R} \times (-1, 1) \to \Sigma$ given by

$$h(\theta, s) = (s \cos \theta, s \sin \theta, \theta)$$

is a diffeomorphism (i.e. it is bijective, and both h and h^{-1} are smooth).