

Analysis III for Engineering Students

Homework sheet 5

Exercise 1:

Let $h : \mathbb{R}^3 \rightarrow \mathbb{R}$ be a function with

$$h(x, y, z) = 16z^2 + x^2 + 4y^2 + 2x - 8y + 5.$$

- a) Check whether the level set $g(x, y, z) = c$, defined by the point $(3, 1, 0)$ forms a smooth surface in the vicinity of this point.
- b) Determine the tangent plane at the point $(3, 1, 0)$ with respect to the surface from a) in parameterized form.
- c) If possible, solve the above equation for one of the variables in order to determine the area explicitly.
- d) Make a sketch of the surface.

Exercise 2:

For the function $f(x, y, z) = y + 2z$ compute and classify the extrema on the intersection of the parabolic cylinder $z = x^2 - 1$ with the plane $z = 2y$ using the Lagrange multipliers method.

Submission deadline: 23.12.2022