Department of Mathematics, University of Hamburg   **WiSe 2023/24**
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Analysis III
for Engineering Students
Homework sheet 5

Exercise 1:

Let $h : \mathbb{R}^3 \to \mathbb{R}$ 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: 22.12.2023