Mathematical analysis 2, WNE, 2018/2019
meeting 14.

9 April 2019

Problems

1. Calculate the partial derivatives of first and second order of

$$f(x, y) = x^2 - 3xy^2 + 2y^3 + 2y.$$

2. Check whether point $(0,0)$ is a local extremum of:

   a) $z(x, y) = x^2 + y^2$,

   b) $z(x, y) = x^2 - y^2$.

3. Determine the extrema of the function

$$f(x, y, z) = x^2 - 2x - y^3 + 3y + 5z^2.$$

4. Does $f(x, y, z) = xy + yz + zx$ have local extrema?

5. Find $\sup_{(x,y) \in D} f(x, y)$ and $\inf_{(x,y) \in D} f(x, y)$ for

   a) $f(x, y) = \sqrt{x^2 + y^2}$, $D = \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 \leqslant 1\}$,

   b) $f(x, y) = xy^2$, $D = \{(x, y) \in \mathbb{R}^2 : x^2 + y^2 \leqslant 3\}$,

   c) $f(x, y) = x^2 + y^2 - x - y$, D is a triangle with vertices $(0, 0)$, $(0, 2)$ and $(2, 0)$,

   d) $f(x, y) = x^2 + y^2 - x$, D is a square with vertices $(\pm 1, \pm 1)$.

We will be having a short test at the beginning of our next meeting!