MA286 Analysis I – Assignment 1

September 24, 2012, Lecturer: Claas Röver

QUESTION 1. Consider $f(x, y) = x^2 + 3y^2$. Draw a contour map for f with at least six level curves and sketch the gradient field of f.

QUESTION 2. Calculate the partial derivatives with respect to all variables of the following functions.

(a) $f(x, y) = (x-y)(xy^2+x^2y)$ (b) $g(x, y, z) = 4z^2y-5x^3y^2+2xyz$ (c) $h(x, y) = \dfrac{sin(x-2y)}{x+y}$

QUESTION 3. Determine the function whose graph is the tangent plane to the graph of f at the given point.

(a) $f(x, y) = 3x^2y - xy^3 + e^{-x^2}$, $(2, 1, f(2, 1))$
(b) $g(x, y) = y \log(x + 1) - x + 3y$, $(0, 1, g(0, 1))$

QUESTION 4. Let $f(x, y) = x - x(y + cos(x))$.

(a) Calculate the directional derivative of f in the direction $(3, 1)$.
(b) Determine the direction $\mathbf{v}$ such that $\frac{\partial f}{\partial \mathbf{v}}(0, 0)) = 0$.

QUESTION 5. Find all local maxima and minima, as well as saddle points of $f(x, y) = \dfrac{4y^2 + x}{x^2 + y^2 + 1}$.

Hand in your written solutions at the **beginning** of the lecture on **Wednesday, 3 October 2012**.