Multivariate calculus M
Department of Mathematics
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Homework 2.

2. Homework

You may earn 2 extra points to the exam by solving all the problems. Each problem is of equal worth 0.5 points. Submission is due to Wednesday 27th April at 12.00 through Studium as a single pdf-file.

It is strongly recommended to try to solve the problems! On top of the extra points, it is good practice for the exam which may contain similar problems.

Problems

2.1 Find the maximum and the minimum value of the function $f(x,y) = 2x + y - (x^2+y^2)^2$ on $\{(x,y) : 0 \leq x + 2y \leq 2, x, y \geq 0\}$.

2.2 Let $A(a,b)$ be the area of the ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} \leq 1$. Determine the function $A(a,b)$ (by integration) and find the maximum value of A on $a + b = 2$.

2.3 Compute $\int\int_D xydxdy$, where $D = \{(x,y) : x^2 + y^2 - 2x + 6y \leq 6\}$.

2.4 Determine the values of α for which the integral $\int\int_{\mathbb{R}^2} \frac{\min(1, x^2+y^2)}{(x^2+y^2)^{\frac{\alpha}{2}}} dxdy$ converges. Here $\min(a,b) = a$ if $a \leq b$ and $\min(a,b) = b$ if $b < a$.