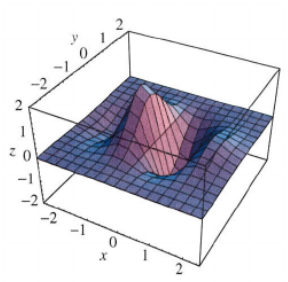
Mathematical analysis II — Homework 10

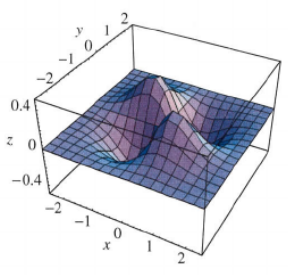
Due: 9:00, 15.5.2019

Write your solution of each problem on a separate sheet of paper of format A4, without torn edges. One part will be marked for credit.

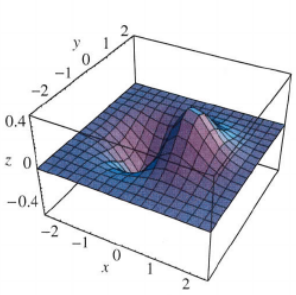
Problem 1: Graph on the figures belong to functions f, $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$, $\frac{\partial^2 f}{\partial y^2}$, $\frac{\partial^2 f}{\partial x^2}$ and $\frac{\partial^2 f}{\partial x \partial y}$. Determine, which graph belong to which function and briefly justify your decisions.



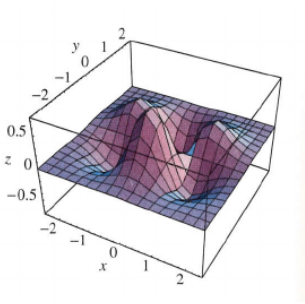
(a)



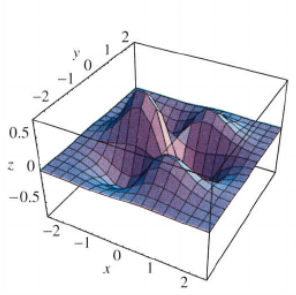
(b)



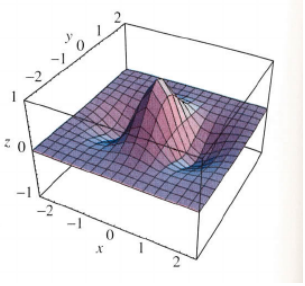
(c)



(d)



(e)



(f)

Problem 2: Find all global and local minima and maxima of the function $f(x,y) = \frac{8x^3}{3} + 4y^3 - x^4 - y^4$ on $\mathbb{R}^2$. Recall when the Hessian matrix is semidefinite, we cannot immediately conclude whether f has or does not have an extremum at a given point!

Problem 3: Give an example of a two-variable function, which has infinitely many strict local maxima, but has no local minimum at all.