MA286 Analysis I – Problem Sheet 1

September 10, 2012, Lecturer: Claas Röver

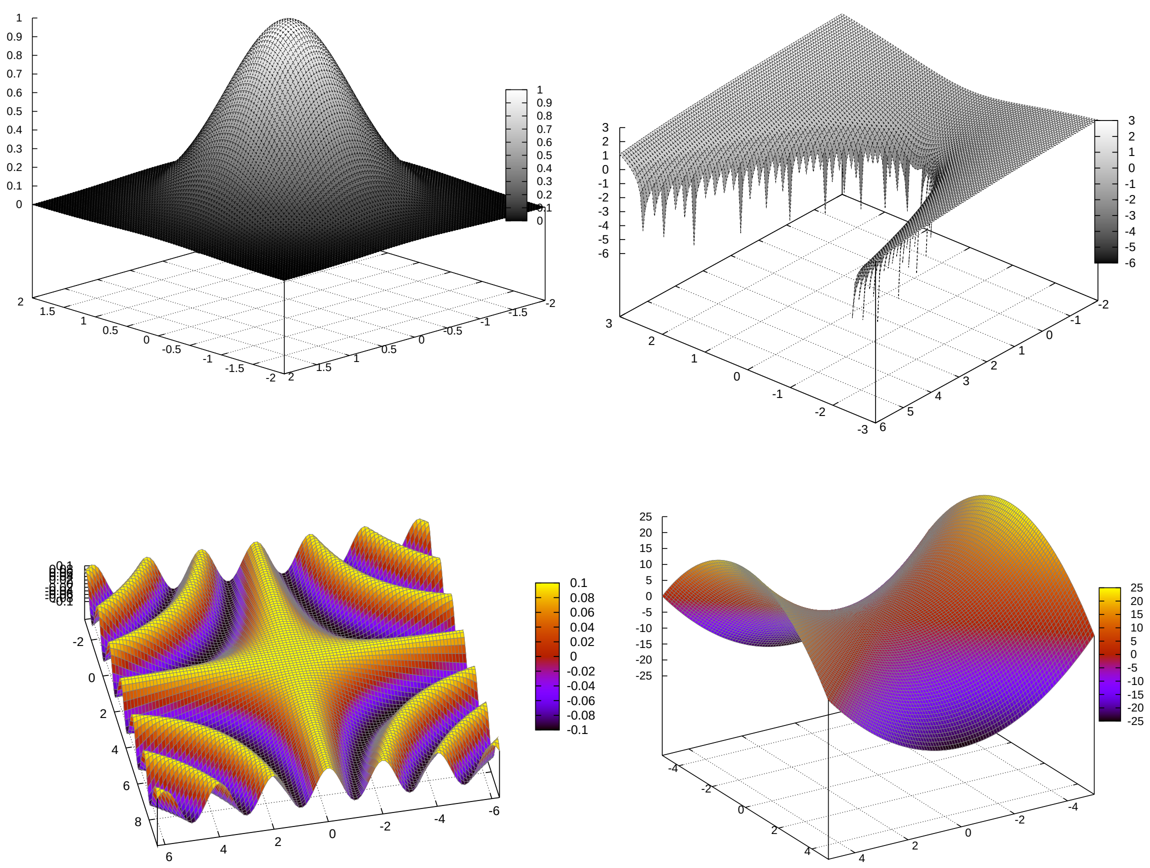
Consider the following functions.

$$f(x,y) = \ln(x^2 - y), \quad g(x,y) = \cos(x(y-\pi)/2)/10, \quad h(x,y) = x^2 - y^2, \quad k(x,y) = e^{-x^2-y^2}$$

QUESTION 1. Determine the domain and range of each of the functions above.

QUESTION 2. Sketch at least five level curves for each the functions above.

QUESTION 3. Each of the graphs below corresponds to one of the functions above. Match them and determine, if possible, the x and y axes.



QUESTION 4. Calculate the partial derivatives of all the functions above.

QUESTION 5. Sketch the gradient field of each of the functions above.

QUESTION 6. Determine the partial derivatives of the following functions.

$$f(x,y) = (x - xy + y) + \sin(x + 2y), \qquad g(x,y) = 2xy^2 - \frac{\cos(x)\sin(y)}{x+y}$$

$$h(x,y) = (x - yx^2 + 5)\ln(x + y^3), \qquad k(x,y) = 5 - \sqrt{x^2 + y^2}$$

QUESTION 7. Draw the profile of the function f from Question 6 along (a) the x-axis, (b) the y-axis and (c) theline $x = y$.

QUESTION 8. Sketch the graph of the function k from Question 6.