

MATH 271 – Homework #2

due 5 February 2009

All calculations must be done in Maple!

- 1) Find the directional derivative of the function

$$f(x, y, z) = x^2y - xy\sqrt{z}$$

at the point $(2, -3, 4)$ in the direction of the vector $\begin{bmatrix} 3 \\ -2 \\ -1 \end{bmatrix}$.

- 2) Consider the function

$$g(x, y) = x^4 + y^4 - 4xy.$$

- a) Find all critical points of g .
 - b) Classify each critical point as either a local minimum, a local maximum, or a saddle point.
 - c) Produce a contour plot of g that shows all the critical point. Comment on how each critical point (and its classification) appears on your plot.
- 3) A flat circular plate has the shape of the region $x^2 + y^2 \leq 1$. This plate, including its boundary, is heated so that the temperature T at any point (x, y) is given by

$$T(x, y) = x^2 + 2y^2 - x.$$

Find the hottest and coldest points on the plate and the temperature at each of these points.