Numerical Simulation

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Exercise Sheet 6.

Due date: **Wednesday, 28 May**.

Programming Exercise 1. Implement a Newton method and use it to minimize the Rosenbrock function

$$f : \mathbb{R}^2 \to \mathbb{R}, \quad f(x, y) = (1 - x)^2 + 100(y - x^2)^2.$$

This means, find by Newton's method a root of the gradient

$$\nabla f = \left(400(x^3 - xy) + 2x - 2,\ 200(y - x^2) \right).$$

The function f has a unique global minimum in $(1, 1)$. Observe your results for the start points $(0, 0)$, $(0, 2)$, and a start point of your choice. How many iterations are needed to reach the asymptotical convergence rate of the Newton method? Give a convergence plot.

Repeat your experiments with the modified function $g(x, y) := f(B(x, y))$, with $B := \left(\begin{smallmatrix} 2 & 5 \\ -1 & 4 \end{smallmatrix} \right)$.

(6 points)