Universität Konstanz *WS 12/13*
Fachbereich Mathematik und Statistik
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Übungen zu **Numerische Verfahren der restringierten Optimierung**

http://www.math.uni-konstanz.de/numerik/personen/volkwein/teaching/

Sheet 2 **Submission: 26.11.2012, 9:45 o'clock**

Exercise 4 (Homework) (2 Points)

Consider the following linear program in $\mathbb{R}^2$:

$$\min x_1 \quad \text{subject to} \quad x_1 + x_2 = 1, \quad (x_1, x_2) \geq 0.$$

Show that the primal-dual solution is

$$x^* = \begin{pmatrix} 0 \\ 1 \end{pmatrix}, \quad \lambda^* = 0, \quad \mu^* = \begin{pmatrix} 1 \\ 0 \end{pmatrix}.$$

Also verify that the system $F(x, \lambda, \mu)$ (Scriptum (2.4a)) has a spurious solution

$$x = \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \quad \lambda = 1, \quad \mu = \begin{pmatrix} 0 \\ -1 \end{pmatrix},$$

which has no relation to the solution of the linear system.

Remark: This exercise illustrates the fact that the relation $(x, \mu) \geq 0$ (Scriptum (2.4b)) is essentiel.

Exercise 5

Given the problem

$$\min(x-2)^2 + 2(y-1)^2 \quad \text{u.d.N.} \quad x + 4y \leq 3, \quad x \geq y.$$

Set up the Lagrange function and solve the problem using the KKT system.

Exercise 6

If f is convex and the feasible region Ω is convex, show that local solutions of $\min_{x\in\Omega} f(x)$ are also global solutions. Show that the set of global solutions is convex.