## Standort-Optimierung

# 2. Übung

**Sommersemester 2010**

**Bergische Universität Wuppertal**
Fachbereich C – Angewandte Mathematik / Optimierung und Approximation
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Besprechung der Aufgaben: Dienstag 4. Mai 2010

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**Aufgabe 5:**

a) Show that the optimal solution $x^*_{l_2^2}$ of a problem of type $1/P/\bullet/l_2^2/\sum$ with existing facility locations at $a_1, \dots, a_n$ is always located in conv $(a_1, \dots, a_n)$, the convex hull of the existing facilities.

b) Show that the same also holds for problems of type $1/P/\bullet/l_2/\sum$.

**Aufgabe 6:**
Prove Lemma 2.17., i.e., show that

$$\max_{x \in \mathbb{R}^2} \{WH(x) - W(x)\} \leq \sqrt[p]{2}\sqrt{\epsilon}\left(\sum_{j=1}^{n} w_j\right)$$

holds $\forall x \in \mathbb{R}^2$.

**Aufgabe 7:**
Let $u_i, v_i > 0 \ \forall i = 1, \dots, M$, $a_1 < a_2 < \dots < a_M$ and

$$g_i(x) = \begin{cases} u_i(a_i - x) & if \quad x \leq a_i \\ v_i(x - a_i) & if \quad x > a_i \end{cases} \quad \forall i = 1, \dots, M.$$

Minimize $f(x) = \sum\limits_{i=1}^{M} g_i(x)$ by deducing and proving some optimality condition for this "Asymmetric Median-Problem".

**Aufgabe 8:**
Consider four existing facilities: $a_1 = (-y, 0)$, $a_2 = (y, 0)$, $a_3 = (y, y)$ and $a_4 = (-y, y)$ with equal weights $v_1 = v_2 = v_3 = v_4 > 0$ and $y > 0$. Determine all optimal solutions for the problems

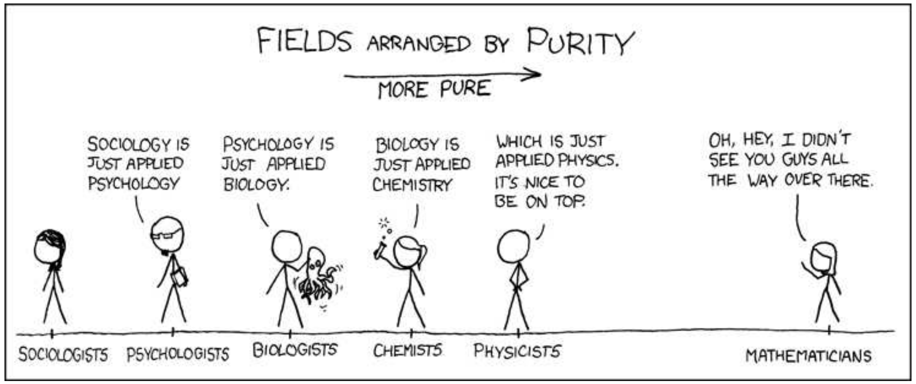
a) $1/P/\bullet/l_\infty/\sum$,

b) $1/P/\bullet/l_1/\sum$,

c) $1/P/\bullet/l_2^2/\sum$ and

d) $1/P/\bullet/l_2/\sum$

and compare the results. (Apply the Weiszfeld Algorithm on $1/P/\bullet/l_2/\sum$ and use the optimal solution of $1/P/\bullet/l_2^2/\sum$ as starting point.)




*Bemerkung:* Aktuelle Informationen zur Vorlesung und zu den Übungen finden Sie im Internet unter:

http://www.math.uni-wuppertal.de/opt/location_ss2010/