Discrete and Computational Geometry Winter term 2016/2017
Exercise Sheet 07
University Bonn, Institute of Computer Science I

Deadline: Tuesday 6.12.2016, until 12:00 Uhr Discussion: 12.12. - 16.12.

- *Please give your solutions directly to the tutor or put them in the postbox at LBH next to E.01 until the deadline. Write your names well visible and readable on the first page. If your solutions consists of multiple pages, make sure they are well connected.*
- *It is possible to submit in groups of up to three people.*

Aufgabe 1: Good pairs in partial orders (4 Points)

Consider the following partial order relation on the set $X = \{a, b, c, d, e\}$:
$\lesssim := \{(a, b), (a, c), (a, e), (b, c), (d, c)\} \cup \{(x, x) \mid x \in X\}$.

a) Draw a graph representation of this relation (you can omit the reflexive relations as it was always done during the lecture).

b) Give the extension set $e(\lesssim)$. (You can give an linear order as a list (e.g. abcde or dcbea)). Calculate $h(x)$ for $x \in X$.

c) Based on the results from **b)**, list all *good* pairs. What is the quality of each pair (i.e. the ratio by which it partitions $e(\lesssim)$)? For each such pair, draw the graph representation of the two partial orders that can result from querying that pair.

Aufgabe 2: Affine dependency (4 Points)

Let $a_1, \ldots, a_n$ denote vectors in $\mathbb{R}^d$. Show that the following two statements are equivalent:

(i) The n vectors $a_1, \ldots, a_n$ are affine dependent.

(ii) The $n-1$ vectors $a_1 - a_n, a_2 - a_n, \ldots, a_{n-1} - a_n$ are linear dependent.