Discrete and Computational Geometry, SS 18
Exercise Sheet "6": Brunn Minkowski inequality
University of Bonn, Department of Computer Science I

- *Written solutions have to be prepared until* **Thursday 14th of June**.
- *You may work in groups of at most two participants.*
- *You can hand over your work to our tutor Raoul Nicolodi in the beginning of the lecture.*

Exercise 16: Concavity of volume functions (4 Points)

Let $A \subset \mathbb{R}^d$ be a set containing a single point and $B \subset \mathbb{R}^d$ the unit hypercube.

a) Give an explicit formula for the volume function $v(t) = \text{vol}((1-t)A + tB)$.

b) Prove $v(t)^\beta$ is not concave on $[0,1]$ for any $\beta > \frac{1}{d}$.

Exercise 17: Complexity of Minkowski-sum in $\mathbb{R}^2$ (4 Points)

Let P and Q be convex polygons with n and m edges respectively.
Prove: The Minkowski-Sum $P \oplus Q$ is a convex polygon with at most $n+m$ edges!

Exercise 18: Arithmetic and geometric mean (4 Points)

Show that for n reals $x_1, x_2, \ldots, x_n$ the inequality

$$\frac{x_1 + x_2 + \cdots + x_n}{n} \geq (x_1 \cdot x_2 \cdot \cdots \cdot x_n)^{\frac{1}{n}}$$

holds.