

Summer Term 2023

Assignment on Computational Geometry - Sheet 4

Due Date 10. 07. 2023

Due by 10. 07. 2023 via email to weller@informatik.uni-bremen.de

Exercise 1 (Convex Sets, 5 Credits)

Show that a convex set K and a line can intersect in at most one contiguous interval. In other words, the border of K and the line can have at most 1 or 2 intersection points. (In the case of 1 intersection point, the line is called a *tangent*.)

Exercise 2 (Convex Hulls, 5 Credits)

Provide a non-inductive proof that the convex hull $CH(P)$ over a finite set P of points in \mathbb{R}^2 has a subset of P as vertices. Hint: you could use the fact that the intersection of convex sets is convex, and you could try to find a suitable set of convex sets, the intersection of which yields $CH(P)$.

Exercise 3 (Graham's Scan, 5 Credits)

Show that the algorithm *Graham's Scan* can handle input points with equal x-coordinate without any changes. Which case needs special treatment?

Exercise 4 (Clarkson-Shoe Algorithm, 5 Credits)

Given an edge e with adjacent triangles f_1 and f_2 . Give the geometric predicate for e being a silhouette edge with respect to some point p_r . (One of the geometric predicate needed in the Clarkson-Shoe algorithm.)