HW 1

CS 498CG: Discrete & Computational Geometry, Spring 2023   Version: **2.0**

- Guidelines for homework submissions will follow CS 374 (but hopefully more relaxed):
  `https://courses.engr.illinois.edu/cs374/fa2022/a/info/hw_policies.html`
  Read them before submitting your homework.

Some important course policies

- **You may use any source at your disposal** – paper, electronic, or human-but you *must* cite *every* source that you use, and you *must* write everything yourself in your own words. See the academic integrity policies on the course web site for more details.

- Homeworks have to be **typed** – hopefully using LATEX. You need to submit only the pdf. Please use separate pdf for each problem. Illustrations/figures can be hand drawn (its recommended that use a tablet), and included in your pdf as needed.

- Homework groups should be up to size 3. If you want bigger group, please contact me first.

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1 (100 PTS.) Problem 1.10.

Do problem 1.10 in [dBCvKO08] (this page 17 in the third edition of this book).

2 (100 PTS.) Problem 2.13.

Do problem 2.13 in [dBCvKO08] (page 43).

3 (100 PTS.) Convexity.

For a finite point set P in $\mathbb{R}^d$, we defined the convex-hull $\mathcal{CH}(P)$ as all the points that are formed by convex-combinations of the points of P. See here.

Let $\mathcal{F}$ be the set of all convex sets that contain P. Proof that $\mathcal{CH}(P) = \bigcap_{f \in \mathcal{F}} f$.

(Hint: Prove it by induction on the size of P.)

References

[dBCvKO08] Mark de Berg, Otfried Cheong, Marc J. van Kreveld, and Mark H. Overmars. *Computational Geometry: Algorithms and Applications*. Springer, Santa Clara, CA, USA, 3rd edition, 2008.