Please work on these problems and be prepared to share your solutions with classmates in class. Assignments will not be collected for grading.

We agreed that some of the problems from last week would be revisited. In particular:

2. The $O(n \log n)$ algorithm to compute the convex hull of a set of $n$ points in the plane that was described in this chapter is based on the paradigm of incremental construction: add the points one by one, and update the convex hull after each addition. In this exercise we shall develop an algorithm based on another paradigm, namely divide-and-conquer.

   a. Let $P_1$ and $P_2$ be two disjoint convex polygons, that are separated by a vertical separating line, with $n$ vertices in total. Give an $O(n)$ time algorithm that computes the convex hull of $P_1 \cup P_2$.

   b. Use the algorithm from part a to develop an $O(n \log n)$ time divide-and-conquer algorithm to compute the convex hull of a set of $n$ points in the plane.

4. Give an example of a simple polygon and a set of guards that sees all the “walls” of the polygon but yet misses some of the interior of the polygon.

5. Give an example of a simple polygon where allowing guards anywhere in the polygon requires fewer guards than restricting the guards to vertices only.

And here are some new problems to work on this week.

6. Give the pseudo-code of an algorithm to compute a 3-colouring of a triangulated simple $n$-gon. Please provide an argument (a proof) that your algorithm works, and show that it runs in $O(n)$ time.

7. Which polygons have the fewest number of distinct triangulations? Which polygons have the largest number of distinct triangulations.

8. Given simple polygon $P$ with $n$ vertices a a point $p$ inside it, show how to compute the region inside $P$ that is visible from $p$. 