Exercise 1

You are given

- a star-shaped polygon $P \subseteq \mathbb{R}^2$, represented as a doubly connected list of its vertices $V(P)$,
- and a point $c \in P$ (not necessarily in $V(P)$), such that for all $p \in P$ the line segment $cp$ is contained in $P$.

Describe an algorithm which triangulates $P$ in linear time. The algorithm could for example output all edges of the triangulation that are not already edges of the polygon.

Exercise 2

This exercise is about an application from *Computational Biology*:
You are given a set of disks $P = \{a_1, \ldots, a_n\}$ in $\mathbb{R}^2$, all with the same radius $r_a > 0$. Each of these disks represents an atom of a protein. A water molecule is represented by a disc with radius $r_w > r_a$. A water molecule cannot intersect the interior of any protein atom, but it can be tangent to one. We say that an atom $a_i \in P$ is solvent-accessible if there exists a placement of a water molecule such that it is tangent to $a_i$ and does not intersect the interior of any other atom in $P$. Given $P$, find an $O(n \log n)$ time algorithm which determines all solvent-inaccessible atoms of $P$. 