Exercise 1 Let a and b be two points in $\mathbb{R}^d$. We say that a dominates b if $b_i \leq a_i$ for all $i = 1, \ldots, d$ and $b_j < a_j$ for at least a j, $j \in \{1, \ldots, d\}$. Given a set $P = \{p^1, \ldots, p^n\}$ of points in $\mathbb{R}^d$, the subset of points that are not dominated by any other point in P is called the *nondominated subset*.

a) Given a set $P = \{p^1, \ldots, p^n\}$ of n points in $\mathbb{R}^2$, sketch the pseudo-code of an algorithm that returns the nondominated subset by performing pairwise comparisons. Assume that all points in P are distinct. Discuss its time complexity.

b) Improve the previous algorithm by using a sweeping approach. Discuss its time complexity.

c) Consider that the complete input is not known in advance. Every time a new point arrives, the algorithm should return the updated nondominated subset. Sketch the pseudo-code of a procedure that receives the current nondominated subset and the new point and returns the updated nondominated subset. Discuss its time complexity for n points.

Exercise 2 Given a set of cubes, compute the volume of their intersection. Assume that each cube is described by its size and by the vertice with the smallest (x,y,z)-coordinate value.