Problem 1 (Segment-Segment Intersection). Let $S$ be a set of non-intersecting segments in $\mathbb{R}^2$. Given a vertical segment $q = x \times [y_1, y_2]$, a query reports all the segments in $S$ intersecting $q$ (e.g., in the figure below, the query reports two segments). Preprocess $S$ into a data structure of $O(n)$ space such that a query can be answered in $O((k + 1) \log n)$ time, where $k$ is the number of segments reported.

Problem 2 (Segment-Segment Intersection). Consider the previous problem again. Let $s, s'$ be two segments in $S$. We say that $s'$ is vertically adjacent to $s$ if we can shoot a vertical ray either upward or downward from an endpoint of $s'$, such that $s$ is the first segment in $S$ hit by the ray. The vertical visibility of $s$ is defined as the number of segments in $S$ (other than $s$) vertically adjacent to $s$. For example, the vertical visibility of $s_1$ is 3, while that of $s_2$ is 1.

Let $\lambda$ be the maximum vertical visibility of all segments in $S$. Preprocess $S$ into a data structure of $O(n)$ space such that a query can be answered in $O(\log n + k \log \lambda)$ time, where $k$ is the number of segments reported.