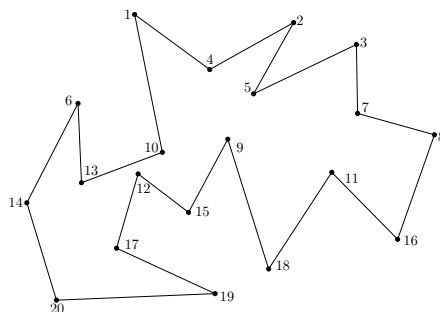


## Homework assignment no. 2

1. (a) Draw a polygon  $P$  and place guards in it, such that the guards cover the boundary of  $P$ , but there exists a point in the interior of  $P$  that is not seen by any of the guards.  
 (b) Define a family of polygons  $P_6, P_8, P_{10}, \dots$ , such that  $P_k$  has  $k$  vertices and there is a way to place  $k/2$  guards at every other vertex of  $P_k$  so that *not* every point in  $P_k$  is seen by a guard.
2. Give an efficient algorithm to determine whether a polygon  $P$  with  $n$  vertices is monotone with respect to some line, not necessarily a horizontal or vertical one. [dBCvKO]
3. List the diagonals that will be added to the polygon below by the algorithm for partitioning a polygon into  $y$ -monotone pieces.



4. Prove that the query time of a three-dimensional kd-tree is  $O(n^{2/3} + k)$ .
5. Let  $\mathcal{R} = \{R_1, \dots, R_n\}$  be a set of  $n$  axis-parallel rectangles in the plane. Describe an output-sensitive algorithm for computing the set  $\{\{R_i, R_j\} \mid R_i, R_j \in \mathcal{R}, i \neq j, R_i \cap R_j \neq \emptyset\}$ .

**Submission:** December 6, 2018.