Problem (30 pts)

In the art gallery guarding problem we are given a line $L$ that represent a long hallway in an art gallery. We are also given a set $X = \{x_0, x_1, \ldots, x_{n-1}\}$ of real numbers that specify the position of paintings in this hallway. Suppose a single guard can protect all the paintings within distance 1 of his position (on both sides).

Design an algorithm for finding a placement of guards that uses the minimum number of guards to protect all the paintings with positions in $X$. Present the pseudocode. Prove that your algorithm minimizes the number of guards, and analyze its running time which must be polynomial; $O(n \log n)$ gives an extra 3 points.