

Classwork 1

In the following problems, and in general in this course, the indexing will start from 1 and end at n (rather than starting at 0 and ending at $n-1$).

Problem 1

Input: A sorted array A of size n

Output: an index, i , such that $A[i] = i$; -1 if no such index exists.

Problem 2

Input: An array A of size n

Output: an index i , such that $A[i]$ is a local maxima, i.e. $A[i]$ is greater than or equal to the two numbers around it; if $i=1$ or $i=n$ then $A[i]$ need only be greater than or equal to its only neighbor.

Problem 3

You are given an extremely large array A in which the first n cells contain non-negative integers in sorted order and the rest of the cells are filled with -1. *You do not know the value of n .* Describe an algorithm that takes an integer x as input and finds a position in the array containing x , if such a position exists, in $O(\log n)$ time – again, you do not know the value of n .