Algorithm Lab-4 (Date 25th & 26th January 2017)

1. Given a sorted list of 'n' elements. You need to search a number 'x' in that list. If the element 'x' is present in the list you have to return the index. If it is not present return -1. Write an algorithm to implement the solution to above problem using
   a. Linear search.
   b. Binary Search
   c. K-ary search, where $K = 3$

2. An array of 'n' numbers has been given. You need to return a number in the array, which is neither maximum nor minimum.
   a. Implement a $O\ (n)$ algorithm to find the number, which is neither maximum nor minimum when the array *elements are not distinct*.
   b. In case, all the n-elements are distinct modify the implementation to run the solution in $O\ (1)$ time.

3. (**Bonus Problem**) Let $P_1(x, y_1), P_2(x, y_2), \dots\ , P_n(x, y_n)$ be a collection of n distinct points lying on a vertical line L. The value of x is stored in a variable, and $y_1, y_2, \dots\ , y_n$ are stored in an array in decreasing order. Additionally, you are given two points $S\ (x', y')$ and $D\ (x'', y'')$, one on either side of L. A route R from S to D is a two-hop path $S \rightarrow P_k \rightarrow D$, where P_k is one of the points from $\{P_1, P_2, \dots P_n\}$. The cost of R is defined as the sum of the length of $S \rightarrow P_k$ and $P_k \rightarrow D$. Implement an $O(\log n)$ time algorithm to find the minimum cost route from S to D i. e. your task is to select an appropriate point P_k on L such that the cost of the route R from S to D through P_k is minimized.