

### HOMEWORK 3

1. Find both the smallest and largest values in an array of size  $n$ .
  - a. Analysis the complexity of the divide-and-conquer algorithm presented in class without using the Master theorem. Assuming that comparisons are the basic operations.
  - b. Design an equivalent loop algorithm to solve this problem.
2. Analysis the complexity of Mergesort algorithm without using the Master theorem in two cases:
  - a. Consider the comparison to be the algorithm's basic operation.
  - b. Consider the data movement to be the algorithm's basic operation.
3. It's known that Mergesort algorithm runs in linearithmic time. However, with a small change of the source code and a proper distribution of the input array, the algorithm may run in linear time.
  - a. Describe the distribution of the input array in this context.
  - b. Show the source code that implements the modified Mergesort algorithm.

*Note:* Let's assume that we want to sort the input array in ascending order.