DS HW 6

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7.1

BASE: An array of length 1 is already a sorted array. Also, insertion-sort will not go into the for loop; thus insertion-sort will return a sorted array when length of the array is 1.

Hypothesis: An array of size N is sorted by insertion-sort.

Proof: Will insertion-sort sort array of size N+1?

Array up to N will be well sorted according to the hypothesis. Insertion sort will now find the right position for the last element by iterating the N elements until it finds the position where A[i] <= last element <= A[i+1]. This is the characteristic of a sorted array, and N+1 length array is now sorted.

7.3

Yes, the new implementation would work correctly because iterating more from i to 0 wouldn’t change the array, as that portion is already sorted. It wouldn’t change the asymptotic complexity (still O(n^2)). However, it would be slower compared to original bubble sort as it is doing extra, unnecessary iterations.

7.4

It would reduce the number of comparisons required to insert the logn (n being the subarray’s lenght