

Analysis of Algorithms

CS 375, Spring 2019

Homework 9

Due **AT THE BEGINNING OF CLASS** Monday, March 18

- *A general note:* When writing up your homework, please write neatly and **explain your answers clearly**, giving all details needed to make your answers easy to understand. Graders may not award credit to incomplete or illegible solutions. Clear communication *is* the point, on every assignment.

Exercises

1. Consider this pseudocode algorithm for the sorting method *Selection Sort*:

```
SELECTIONSORT(A[1..n])
  for i = 1 to length[A] - 1
    min = i
    for j = i + 1 to length[A]
      if A[j] < A[min]
        min = j
    // the next 3 lines swap A[i] and A[min], using a temporary variable
    temp = A[i]
    A[i] = A[min]
    A[min] = temp
```

Given the following proposed loop invariant for the outer for loop of SELECTIONSORT, show the *maintenance* part of a correctness argument using the invariant.

To do this, consider the loop invariant, presented here for convenience:

Subarray $A[1..i-1]$ contains the $i-1$ smallest elements of A in sorted order,
and $A[i..n]$ consists of the remaining values of A (no constraint on order).

Then, to show the maintenance step, show that for the algorithm as given here, if the invariant is true at the beginning of an iteration, then it's true at the end of the iteration / the beginning of the next iteration. That is, for any iteration m , if it's true when $i = m$, then it's true when the iteration is over and i becomes $m + 1$. Use the definition of the algorithm (i.e., the pseudocode) in the explanation. (Diagrams or specific examples are not sufficient for an explanation, but if you'd like to include them along with a textual explanation, feel free do so.)