5) (10 pts) ALG (Sorting)

a) (3 pts) The following diagram shows an initial array, followed by what the array looks like after a single pass of some sorting algorithm. Indicate what sorting algorithm is being applied, and give that algorithm's worst-case runtime (using big-oh notation).

22	49	36	22	17	18	4

4	49	36	22	17	18	22

Sorting algorithm being applied: Selection Sort Grading: 2 pt, all or nothing

Worst-case runtime for algorithm: $O(n^2)$ Grading: 1 pt, all or nothing

b) (3 pts) For the following arrays, follow the same instructions from part (a):

84	19	23	66	91	44	42

19	23	66	84	44	42	91

Sorting algorithm being applied: Bubble Sort Grading: 2 pt, all or nothing

Worst-case runtime for algorithm: $O(n^2)$ Grading: 1 pt, all or nothing

c) (4 pts) Give a recurrence relation that represents the runtime for Merge Sort of n items. Let T(n) represent the runtime of Merge Sort of n items in setting up your recurrence relation.

$T(0) = T(1) = c_1$
$T(n) = 2T(n/2) + c_2*n + c_3$ (for $n > 1$)
Alternatively: $T(n) = 2T(n/2) + O(n)$ (for $n > 1$)

Grading: 2 pts for $2T(n/2)$
2 pts for $+ O(n)$ or similar