

# SPRING 2019: COT 5407 INTRO. TO ALGORITHMS

[HOMEWORK 2; DUE FEB 12 VIA EMAIL OR CANVAS]

**General submission guidelines and policies:** ADD THE FOLLOWING SIGNED STATEMENT. Without this statement, your homework will not be graded.

I HAVE ADHERED TO THE COLLABORATION POLICY FOR THIS CLASS. IN OTHER WORDS, EVERYTHING WRITTEN DOWN IN THIS SUBMISSION IS MY OWN WORK. FOR PROBLEMS WHERE I RECEIVED ANY HELP, I HAVE CITED THE SOURCE, AND/OR NAMED THE COLLABORATOR.

Read the handout on **Homework guidelines and collaboration policy** from your course website before you start on this homework. This is very important. You only need to submit solutions to problems marked (**Regular**). All others are optional.

## Problems

6. (**Regular**) Solve and submit any one problem from Exercises 3-2 on p61.
7. (**Exercise**) Solve as many problems as possible from Exercises 3-2 and 3-3(a) on p61.
8. (**Exercise**) Solve and submit any one of the four problems in Exercise 4.5-1 on p96.
9. (**Exercise**) Solve remaining problems from Exercise 4.5-1 (a)-(d) on p96 using the master theorem.
10. (**Exercise**) Solve Exercise 4.5-3 on p96 using the master theorem. Make sure you are able to explain how you got the recurrence in the first place.
11. (**Exercise**) Explain in a couple of sentences why the correct recurrence for INSERTIONSORT is

$$T(N) \leq T(N - 1) + O(N)$$

HINT: Consider the last iteration.

12. (**Regular**) Solve any four problems from Exercises 4-1 and 4-3 on p107-108.
13. (**Exercise**) Solve the remaining problems from Exercises 4-1 and 4-3 on p107-108.
14. (**Extra Credit**) You are given a  $N \times N$  matrix of integers where each row and each column is strictly increasing. Design an efficient search algorithm to determine if the matrix contains a given value  $x$ . More importantly, analyze your algorithm. Since this is an extra credit problem, unless the algorithm is the most efficient possible, I cannot give you any credit for your solution.
15. (**Regular**) Register yourself on kattis and write down your registered name on the system.

16. (**Kattis**) Solve the problem called `twostones` in any language of your choice. The problem can be found at <https://open.kattis.com/problems/twostones>
17. (**Kattis**) Solve `convexhull2`