Summer 2008 **CMSC 351: Homework 4** Clyde Kruskal

Due at the start of class Wednesday, June 18, 2008.

Problem 1. Consider the following recurrence, defined for n a power of 5:

$$T(n) = \begin{cases} 19 & \text{if } n = 1 \\ 3T(n/5) + n - 4 & \text{otherwise} \end{cases}$$

(a) Solve the recurrence exactly using the iteration method. Simplify as much as possible.

(b) Use mathematical induction to verify your solution.

Problem 2. Use the formulas derived in class to obtain exact solutions to the following two recurrences.

(a) Let n be a power of 2.

$$T(n) = \begin{cases} 4 & \text{if } n = 1 \\ 5T(n/2) + 3n^2 & \text{otherwise} \end{cases}$$

(b) Let n be a power of 4.

$$T(n) = \begin{cases} 3 & \text{if } n = 1 \\ 2T(n/4) + 4n + 1 & \text{otherwise} \end{cases}$$

Problem 3. Consider the following recurrence.

$$T(n) = \begin{cases} 0 & \text{if } n = 0 \\ T(\lfloor n/2 \rfloor) + T(\lfloor n/4 \rfloor) + 3n & \text{otherwise} \end{cases}$$

Use constructive induction to find a constant c such that $T(n) \leq cn$.

Problem 4. Do Problem 4-2 on page 85 of CLRS.