

HW Assignment 2 (Due date: October 5, Monday)

1. [Divide and Conquer, 20 points] Provide a divide-and-conquer algorithm for determining the **smallest and second smallest values** in a given unordered set of numbers. Provide a recurrence equation expressing the time complexity of the algorithm, and derive its **exact** solution (i.e., not the asymptotic solution). For simplicity, you may assume the size of the problem to be an exact power of a natural number.
2. [Divide and Conquer, 20 points] Describe a divide-and-conquer algorithm for computing a^n (where $n \in \mathcal{N}$) that runs in $\Theta(\lg n)$ time. Justify your answer.
3. [Heap, 20 points] Exercise 6.4-4, page 136. For simplicity, you may assume the size of the problem to be an exact power of a natural number.
4. [Heap, 10 points] Give pseudocode for $\text{HEAP-DECREASE-KEY}(A, i, \text{key})$ that runs in $O(\lg n)$ time for an n -element max-heap.
5. [QuickSort, 10 points] Exercise 7.2-1 page 153.
6. [QuickSort, 10 points] Write the pseudocode for the PARTITION algorithm studied in class.
7. (*) [Algorithm Design, 20 points] Problem 4-2, page 85.