

CSE 548 Homework Assignment 1

Due in Class on Tuesday, September 29

September 16, 2009

1. (Exercise 3.1-1) Let $f(n)$ and $g(n)$ be asymptotically nonnegative functions. Using the basic definitions of Θ -notation, prove that $\max(f(n), g(n)) = \Theta(f(n) + g(n))$.
2. (Exercise 3.1-8) We can extend our notation to the case of two parameters n and m that can go to infinity independently at different rates. For a given function $g(n, m)$, we denote by $O(g(n, m))$ the set of functions

$$O(g(n, m)) = \{f(n, m) : \text{there exists positive constants } c, n_0 \text{ and } m_0 \\ \text{such that } 0 \leq f(n, m) \leq cg(n, m) \\ \text{for all } n \geq n_0 \text{ and } m \geq m_0\}$$

Give corresponding definitions for $\Omega(g(n, m))$ and $\Theta(g(n, m))$.

3. (Exercise 4.5-1) Use the master method to give tight asymptotic bounds for the following recurrences:
 - a. $T(n) = 2T(n/4) + 1$
 - b. $T(n) = 2T(n/4) + \sqrt{n}$
 - c. $T(n) = 2T(n/4) + n$
 - d. $T(n) = 2T(n/4) + n^2$
4. (Exercise 4.5-3) Use the master method to show that the solution to the binary search recurrence $T(n) = T(n/2) + \Theta(1)$ is $T(n) = \Theta(\lg n)$. (See Exercise 2.3-5 of the textbook for a description of binary search.)