

# 15-451 Mini 1

Jan 17, 2008

This mini is due via \*email\* to your TA, by midnight Thursday Jan 24.  
Please use the subject line "15-451 MINI #1" in your email.  
Questions/concerns/comments to Dafna Shahaf (dshahaf+451@cs.cmu.edu)

## 1 Question 1:

Suppose we have three functions  $f(n)$ ,  $g(n)$ , and  $h(n)$  such that  $f(n) = \Omega(g(n))$  and  $g(n) = \Omega(h(n))$ . Must it be the case that  $f(n) = \Omega(h(n))$ ? Explain why or give a counterexample showing why not.

## 2 Question 2:

Algorithm  $A$  uses  $20n \cdot \log(n)$  operations, while algorithm  $B$  uses  $n^3$ . Determine the value  $n_0$  such that  $A$  is better than  $B$  for all  $n \geq n_0$ . ("log" is log-base-2. You should solve this numerically)

## 3 Question 3:

Order the following list of functions by their Big- $O$  time complexity. (That is, order them by growth rate. The first line should have the most slowly growing function. If  $f(n) = \Theta(g(n))$ , put them on the same line)

$2^n$ ,  $(2/5)n$ ,  $7n^5 - n^3$ ,  $\log(n)$ ,  $\log(n^2)$ ,  $\log(\log n)$ ,  $15^{451}$ ,  $n/\log n$ ,  
 $n + 50 \log n$ ,  $\ln(n)$ ,  $n!$ ,  $2^{\log n}$