Complexity Theory

Homework Set No. 1

Date Due: Nov 4th 2004

Please turn in the homework on time. Preferably - printed.

1. Show that if $f(n)$ and $g(n)$ are proper complexity functions then so are $f(n) + g(n)$x, and $f(n)g(n)$.

2. Recall the definition of the median function: Alice holds subset $X \subseteq \{1 \dots n\}$ and Bob $X \subseteq \{1 \dots n\}$ and they wish to find $j \in \{1 \dots n\}$ where j is the median of the (multiset) $X \cup Y$. We have seen a protocol with communication complexity $O(\log^2 n)$. Show that the communication complexity of the median function is $\Theta(\log n)$.

3. Prove that for any rooted binary tree with t leaves there is node v such that the number of leaves in the subtree rooted v is between $t/3$ and $2t/3$.