

CS302 HW4

Problem 1: CS302 [10] + CS307 [5]

Show that mergesort is $O(N \log N)$ for all data. That is, use telescoping to solve $T(N) = 2 T(N/2) + cN$.

Problem 2: CS307 [5]

Redo Problem 1 using brute-force substitution. That is, first substitute the expression for $T(N/2)$ with its recurrence, then repeat for $T(N/4)$ followed by $T(N/8)$. Each time simplify the resulting expression. Now let $N/2$ be step $k=1$, $N/4$ be step $k=2$, and $N/8$ be step $k=3$. Identify the substitution pattern and rewrite the original recurrence relation accordingly. Determine the maximum value of k and simplify to obtain the expected $O(N \log N)$ cost. (Note: This sounds worse than it is.)