

CS 561, HW 1

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Exercise numbers are from the fourth edition of Cormen, Leiserson, Rivest and Stein. Remember: you are encouraged to work on the homework in groups, but please observe the “Star Trek” rule from the syllabus.

1. Is $3^{n+1} = O(3^n)$? Is $3^{2n} = O(3^n)$?
2. Prove that $\log n! = \Theta(n \log n)$ and that $n! = \omega(2^n)$ and $n! = o(n^n)$
3. Problem 3-3 (Ordering by Asymptotic Growth Rates)
4. Assume you have functions f and g , such that $f(n)$ is $O(g(n))$. For each of the following statements, decide whether you think it is true or false and give either a proof or a counterexample
 - (a) $\log_2 f(n)$ is $O(\log_2 g(n))$
 - (b) $2^{f(n)}$ is $O(2^{g(n)})$
 - (c) $f(n)^2$ is $O(g(n)^2)$