

Assignment 1

due Friday, January 18, 2008

1. Suppose that algorithm \mathcal{A} uses $293907n^3$ operations while algorithm \mathcal{B} uses $3n^5$ operations. Determine the value n_0 such that \mathcal{A} is as fast or faster than \mathcal{B} for all $n \geq n_0$. [4 points]
2. exercise 3.1-4, p 50. Additionally, is $2^{2^{n+1}} = O(2^{2^n})$? [4 points]
3. exercise 3-2, p 58 [8 points]
4. exercise 3-3, part a (**not** part b), p 58. [8 points]
5. An algorithm takes 0.2ms for input size 10 (this allows you to determine the constant c , which will be different in each case). How large of an input can be finished in an hour if the algorithm's run time is ... ?
 - (a) $c n$
 - (b) $c n \log n$
 - (c) $c n^3$
 - (d) $c 2^n$[8 points]
6. Describe how to find the minimum *and* maximum of an array of n elements with at most $\frac{3}{2}n$ element comparisons. (Do not count comparisons needed for the array indices.) [4 points]

Total: 36 points

Notes:

- For Q2, we are **not** asking you to do questions 1 through 4. Just question 4 of section 3.1.
- In Q4, ignore any function involving a \lg^* .
- A *ms* is 1/1000 of a second. Also, for the $n \log n$ part, you can approximate n .
- Hint for Q6: form $\lceil \frac{n}{2} \rceil$ pairs, from each pair find candidate min and candidate max for the whole list.