

METCS 566 Homework #1

[Typed answers is a plus. Write on one side of the sheet only. In this assignment your personal analysis counts more than simply laying down the final result. Be concise brief, and neat. No late homework will be accepted.]

1. Two algorithms takes n^2 days and 2^n seconds respectively, to solve an instance of size n . What is the size of the smallest instance on which the former algorithm outperforms the latter algorithm? Approximately how long does such an instance take to solve?
2. In class we hinted (or claimed): the analysis of algorithms for large integers is not affected by the choice of a measure for the size of operands: the number of computer words needed, or the length of their representation in decimal or binary will do equally well. Show that this remark would in fact be false were we considering exponential time. (Hint: *representation of an integer in binary takes 3 to 4 times more bits than in decimal. It takes approximately $\log 10 = 3.322\dots$, where \log is taken base 2*)
3. A sort algorithm takes 100 seconds to sort a 100,000 items on your local machine. How long would you expect it to take to sort 1,000,000 items (a) if you believe that the algorithm takes a time roughly proportional to n^3 , and (b) if you believe that the algorithm takes a time roughly proportional to $n^3 \log n$.