

CS 5300 Advanced Algorithms
HW # 1

1. Suppose we are comparing implementations of insertion sort and merge sort on the same machine. For inputs of size n , insertion sort runs in $8n^2$ steps, while merge sort runs in $64n \lg n$ steps. For which values of n does insertion sort beat merge sort?
2. What is the smallest value of n such that an algorithm whose running time is $100n^2$ runs faster than an algorithm whose running time is 2^n on the same machine?
3. Show how insertion sort sorts the array $A = \langle 13, 41, 30, 29, 2, 15, 17, 51 \rangle$
4. Show how merge-sort sorts the array $A = \langle 13, 41, 30, 29, 2, 15, 17, 51 \rangle$. Use the bottom-up approach.
5. Rank the following functions by order of growth:

$\lg(\lg n), n^2, n!, e^n, n, 2^n, n(\lg(n)), 1$