Algorithms, Spring 2020 at CIS

Homework 2

1. What is an algorithm with the smallest number of comparisons you can find for outputting both the maximum and the minimum of n numbers?

2. What is an algorithm with the smallest number of comparisons you can find for outputting the $n^{1/3}$-ranked item in a list of n unordered distinct items in the comparison-based model? You can use $O(\cdot)$-notation.

3. In class we saw how to find a k-multiplicative spanner with $O(n^{1+1/t})$ edges on any unweighted undirected graph G on n vertices, where $k = 2t - 1$. Suppose now each edge e of G has a weight w_e, and the distance between two nodes u and v in G along a path P is the sum of weights of the edges along P. Then $d_G(u, v)$ is the shortest path distance between u and v. Show how to find a subgraph H of G which is a k-multiplicative spanner with $O(n^{1+1/t})$ edges.