2) (10 pts) ALG (Sorting)

(a) (6 pts) In quick sort, when running the partition function, the first step is to choose a random partition element. In some implementations, instead of just choosing a random element, 3 or 5 random elements are chosen and the median of those elements is then selected as the partition element, as opposed to making the partition element a single randomly selected item. What is the potential benefit of using this strategy (median of 3 or median of 5) versus the default strategy of just choosing a single random element?

(b) (4 pts) The best case run time of an insertion sort of n elements is O(n) and the worst case run time of an insertion sort is $O(n^2)$. Describe how to (a) construct a list of n distinct integers that, when sorted by insertion sort, gets sorted in the best case run time, and (b) construct a list of n distinct integers that, when sorted by insertion sort, gets sorted in the worst case run time.