Exercise Set 5

Exercise 1:
Consider the KNAPSACK Problem with input $w_1, \ldots, w_n, c_1, \ldots, c_n, W \in \mathbb{Z}_+$. Prove that the greedy strategy (taking the elments with the best $\frac{c_i}{w_i}$ ratio) cannot achieve a constant approximation ratio.

(4 Points)

Exercise 2:
Consider the linear-time MEDIAN algorithm. Recall that the list of numbers is partitioned into groups of 5 elements each. Does the algorithm still have linear runtime if the numbers are instead partitioned into

(i) groups of 3 elements each?

(ii) groups of 7 elements each?

(3+3 Points)

Exercise 3:
Britney drives along the Route 66 from Chicago to Los Angeles. The gas tank of her car holds enough gas for n kilometers, and her map gives the distance between the gas stations. Give an efficient algorithm by which Britney can determine at which gas stations she should stop such that she needs the smallest number of stops. (The algorithm should work on any route.)

(4 Points)

Please return the exercises until Tuesday, **May 19th, at 2:15 pm**.