

CSE 680 - Problem Set 4

Due lecture on November 30th

Problem numbers are from the second edition or the third of “Introduction to algorithms”. If unsure about which problem to solve, ask. Collaboration is permitted; looking for solutions from external sources (books, the web, etc.) is prohibited.

1. Show how to sort n integers in the range 0 to $n^3 - 1$ in $O(n)$ time (Hint: radix sort).
2. 11.2-2
3. 11.4-1
4. 22.3-2
5. (a) Suppose we wish to search a linked list of length n , where each element contains a key k along with a hash value $h(k)$. Each key is a long character string. How might we take advantage of the hash values when searching the list for an element with a given key?
(b) Given a graph $G = (V, E)$, show that if $v_1, \dots, v_k \in V$ is the sequence of vertices of a shortest path between v_1 and v_k , then v_1, \dots, v_{k-1} is the sequence of vertices of a shortest path between v_1 and v_{k-1} .
6. Describe an $O(|V| + |E|)$ algorithm for the following problem: Given an undirected graph $G = (V, E)$ as adjacency lists, determine whether we can paint each vertex red or blue so that adjacent vertices get different colors. If such a coloring exists, the algorithm outputs one such coloring. (Hint: Breadth-first search).