Chapter 15 Homework
Deadline: 2021/11/3 10:10 a.m.

1. Peter is an owner of a Japanese sushi restaurant and today he invites you for dinner at his restaurant. In front of you are *n* sushi dishes that are arranged in a line. All dishes are different and they have different costs. Peter hopes that you can select the dishes you want, starting from the left to the right. However, there is a further restriction: when you select a dish, say *A*, the next dish you can select must cost higher than *A*. Design an $O(n^2)$time algorithm to select the dishes so as to maximize the total costs.

2. Let *A*[1..*n*] be an array of *n* distinct integers. Give an algorithm to find the length of a longest increasing subsequence of entries in *A*. The subsequence is not required to be contiguous in original sequence. For example, if the entries are 11, 17, 5, 8, 6, 4, 7, 12, 3, a longest increasing subsequence is 5, 6, 7, 12. Analyze the worst-case running time and space requirement of your algorithm.

3. Please use DP to find a maximum independent set in a tree. Let *G* = (*V*,*E*) be an undirected finite graph where *V* denotes the set of vertices and *E* denotes the set of edges. If *G* is connected and acyclic, then it is called a tree. A subset *I* of *V* is called an independent set of *G* if no two vertices of *I* are adjacent in *G*. Assume that a positive weight *w*(*i*) is associated with each vertex i . We define the weight *w*(*I*) of an independent set to be the sum of the weights of all the vertices in *I*. That is, $w(I) = \sum_{i \in I} w(i)$. Further , an independent set is called a maximum weight independent set if it has maximum weight.