Avi Hirsch

Design and Analysis of Algorithms

HW 6.1

1. (a) Heaviest first does not work, because of case 2 – 3 – 2: the algorithm will select 3, but really 2 and 2 is heaviest.
   (b) This algorithm does not work either: 5 – 2 – 3 – 4 is one example. The algorithm will pick 5 and 3, but the heaviest is actually 5 and 4.
   (c) We know that every node either belongs to an independent set or doesn't. If it does, then the previous node does not. So for each node v_i from i = 1 to n, the sum of all the nodes from i = 1 to n can be represented as the maximum of the following two scenarios: first, node v_i is included in the set and the set's weight is thus the sum of the weight of v_i and the weight of the set until the node before the previous one (until v_{i-2}); second, the node v_i is not included in the set, and the set's weight is thus simply the weight of the set until the previous node (v_{i-1}). Exploring both of those paths and returning the maximum will give the maximum weight.