**CSCI 4041, Fall 2018, Written Assignment 11**

1. With the textbooks approach to the Floyd-Warshall algorithm that uses subscripts, the equation is dij(k) = min(dik(k -1), dij(k-1) + dij(k-1)). This, however, can be changed to D[i,j] = min(D[i,j], D[i,k] + D[k,j]) since no entries for when i = k or j = k will change when on the kth iteration. Because of this, we are able to change the values for D[i, j] without having to worry about using them for later calculations. Thus, we can discard the matrix dij(k-1) and simply use the same matrix D, meaning that the total space required is O(n2).
2. Consider the following graph (where c is any constant value):

c

B

A

In this example, the vertex A is not reachable since there is only one edge in the graph, and it is directed towards B. When Bellman-Ford is run on vertex B as the source in Johnson’s Algorithm, the distance value for B is initialized to 0 while the distance value for A is initialized to ∞. However, the distance value for A will remain ∞ since there is no path from B to A. This means that when we try to reweight W[A, B] we get W[A, B] = c + ∞ - 0 = ∞. Because of this, the distance value for B will be ∞ after running Dijkstra’s on vertex A, meaning the when fixing the reweight later on in Johnson’s, we get the equation Dist[A, B] = ∞ + 0 - ∞ = ∞ - ∞ = NaN. Thus, the professor’s version of the JOHNSON algorithm will give incorrect answers.

1. h(k) = k mod 11

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Index 1:

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Index 3:  3 -> 25

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