CSE100 Algorithm Design and Analysis Lab 13, Spring 2018
Last update: 4/17/2018 Deadline: 11:59pm, 5/4/2018
(**This is a hard deadline. No lab will be accepted after this deadline.**)

The Bellman-Ford Algorithm

In this assignment, you are asked to implement the Bellman-Ford Algorithm which solves the single-source shortest-paths problem. Specifically, you are given as input a directed graph $G = (V, E)$ with weight $w(u, v)$ on each edge $(u, v) \in E$ along with a source vertex $s \in V$. Edges may have negative weights.

Input The input has the following format. There are two integers on the first line. The first integer represents the number of vertices, $|V|$. The second integer is the number of edges, $|E|$. Vertices are indexed by $0, 1, \ldots, |V| - 1$. Each of the following $|E|$ lines has three integers $u, v, w(u, v)$, which represent an edge (u, v) with weight $w(u, v)$. Vertex 0 is the source vertex.

Output The output falls into two possible cases.
Case (i): There is no negative-weight cycle reachable from s. In this case, you must output TRUE on the first line, followed by the shortest distance from s to each vertex in the graph. More precisely, you must output TRUE, $\delta(0, 0)$, $\delta(0, 1)$, $\ldots$, $\delta(0, |V| - 1)$, one per line. Recall that $\delta(u, v)$ denotes the shortest distance from u to v. If a vertex v is not reachable, output INFINITY in place of $\delta(0, v)$.

Case (ii): There is a negative-weight cycle reachable from s. You must output FALSE.

Examples of input and output

```
Input 1
6 10
0 1 6
1 2 5
1 3 -4
1 4  8
2 1 -2
3 0 2
3 2 7
3 4 9
4 0 7
5 2 5

Output 1
TRUE
0
6
9
2
11
INFINITY
```

```
Input 2
6 11
0 1 6
1 2 5
1 3 -4
1 4  8
2 1 -2
3 0 2
3 2 7
3 4 9
3 5 -14
4 0 7
5 2 5

Output 2
FALSE
```

Note that every line is followed by an enter key.

See the lab guidelines for submission/grading, etc., which can be found in Files/Labs.