Correctness of Bellman-Ford's Algorithm:

This proof is made by Contradiction :

show d[v] = δ(s,v) after |V|-1 passes

If shortest distance[v] > shortest[u] + w then we can't update that shortest[v] = shortest[u] + w

– Lemma: d[v] ≥ δ(s,v) always • Initially true • Let v be first vertex for which d[v] < δ(s,v)

• Let u be the vertex that caused d[v] to change: d[v] = d[u] + w(u,v)

• If d[v] < δ(s,v) then

δ(s,v) ≤ δ(s,u) + w(u,v)

δ(s,u) + w(u,v) ≤ d[u] + w(u,v)

Therefore, d[v] < d[u] + w(u,v). Contradiction.