Problem Set 6

Assigned: July 3
Due: July 10

Problem 1.

Let G be a DAG where the vertices are labelled with numerical values.

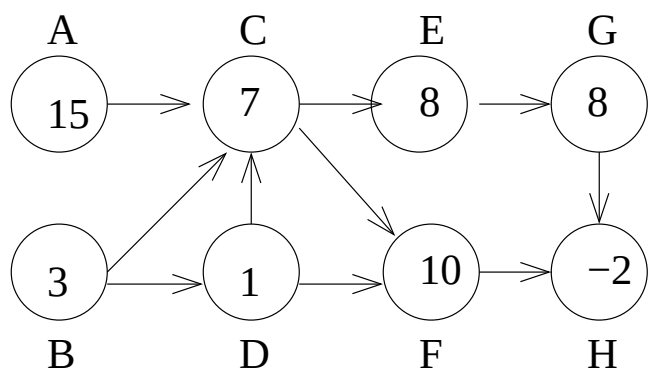
A. Write a function `MaxReachable(u)` which returns the maximum label on a vertex reachable from vertex `u` (including `u` itself.)

B. Write a function `TotalReachable(u)` which returns the sum of the labels on vertices reachable from vertex `u`.

C. Write a function `MaxPathFrom(u)` which returns the maximum sum of the labels on any path starting at `u`.

All these should run in time linear in the size of G.

For example, in the graph below:



`MaxReachable`(B) = 10 (corresponding to F).
`TotalReachable`(B) = 35 (B+C+D+E+F+G+H)
`MaxPathFrom`(B) = 27 (corresponding to B-D-C-E-G).

Problem 2

Suppose that you have two DAGs G and H, with the same vertices and with different edges. We say that G and H are *incompatible* if there is a pair of vertices $u \neq v$ such that there is a path from u to v in G and a path from v to u in H. If there is no such pair, then G and H are compatible.

Write a function to test whether two DAGs G and H are compatible. This should run in linear time.

Problem 3

Trace the execution of Dijkstra's algorithm on the following graph, taking A as the starting vertex. Show the successive states of the array $D[i]$ and of the set of vertices whose distance has been determined.