Problem Set 6

Assigned: July 2
Due: July 9

Problem 1.

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

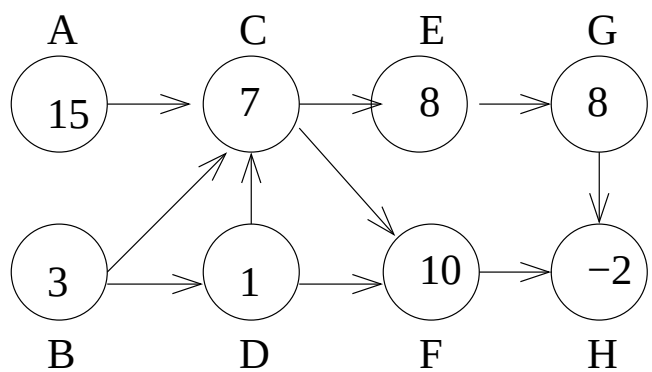
A. Write a function `MaxReachable(u)` which returns the maximum label on a vertex reachable from vertex `u` (including `u` itself.)

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.

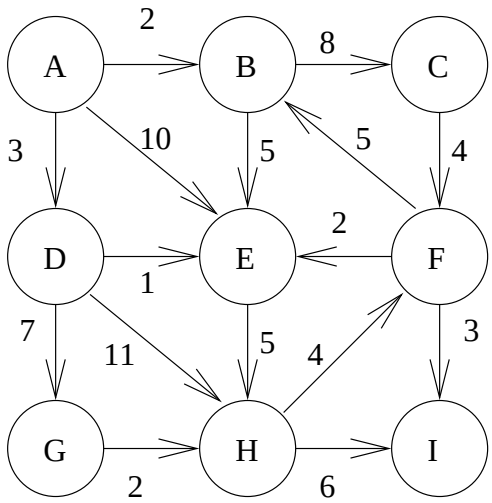
For example, in the graph below:



`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

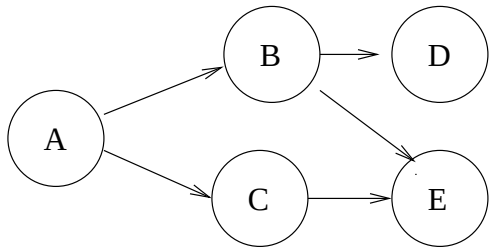
Trace the execution of Dijkstra's algorithm on the following graph, taking A as the starting vertex. Show the successive states of the array $D[i]$ and of the set of vertices whose distance has been determined.



Problem 3

(Siegel Ex. 7.21). Write an algorithm that takes a DAG G as input and prints out *all* the possible topological sorts of G. For instance, given the graph below, the algorithm would output

```
A,B,C,D,E
A,B,C,E,D
A,B,D,C,E
A,C,B,D,E
A,C,B,E,D
```



It should print out each sort only once. Your algorithm does not have to produce the sorts in this order.