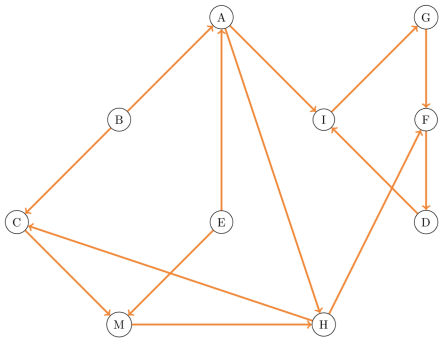
CS6033 Homework Assignment 9*

Due November 19th at 5:00 pm
No late assignments accepted

For all questions in this section. You may use $O(\log n)$ for the running time of the operations `UNION`(x, y), `FIND-SET`(x), and `MAKE-SET`(x).[1]

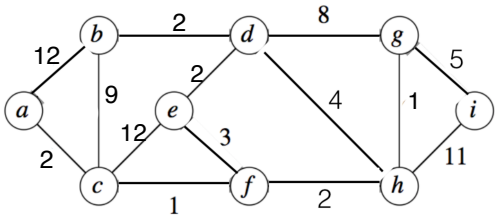
1. Run the STRONGLY-CONNECTED-COMPONENTS(G) Algorithm on the following graph. Give the order that the strongly connected components are found. Draw the GSCC Graph.



2. Run Kruskal's algorithm on the graph below. Show the the order the edges are added to A, and draw the minimum spanning tree T for the graph.

*Many of these questions came from outside sources.

[1]Next lecture we will see if we can find a faster way to perform these operations. A fun at home exercise is to see if you can develop an algorithm that can achieve these running times.



3. What is the running time of Kruskal's algorithm given the time bounds stated above?

4. The algorithm for strongly connected components would be simpler if it used the original (instead of the transpose) graph in the second depth-first search and scanned the vertices in order of increasing finishing times. Does this simpler algorithm always produce correct results?

5. A hyperspace storm is descending on the region, and all spaceships must find a port of call immediately, or be forced to spend months in real-space, where their supplies will inevitably dwindle to nothing. However, space is heavily fragmented, with countless minor polities engaging in constant war, diplomatic incidents, and other forms of conflict. Each traveler must find a planet at least moderately friendly to their home state before the storm arrives.

   The list of k-polities is given in an array. There is an array with the list of all ships currently not safe, and for each ship they have a linked list of all the polities they can safely land on (this is, surprisingly, smaller than the list of the ones they can't).

   Quickly find a way to tell each ship which is their *closest* safe planet to land on.

6. (3 bonus points) Think of a good exam question for the MST's.