Take Home Exam 2 CS 3250 Due Feb 6

No collaboration on this assignment. If you use material from other sources, sources must be cited.

1a) Draw a graph G on 5 vertices, and assign each vertex a number so that each vertex number is equal to both the depth first search numberthat each vertex number is equal to both the depth first search number and the breadth first search number in some BFS and some DFS and G.

1b) Draw a graph G' on 5 vertices such that numbers cannot be assigned to vertices such that vertex numbers correspond to both depth first search numbers and breadth first search numbers for any DFS and BFS of G', and explain why it is not possible to assign such numbers for G'.

2) Design an O(n+m) algorithm to arrange all lists in an adjacency list representation of G so that vertices occur in increasing order of vertex name on each list.

3) Design an O(n+m) algorithm to find all vertices which are on every path from x to y in a graph G. Hint: create a graph of the biconnected components, similar to the graph of strongly connected components.

4) Someone in class last year suggested a new notion of connectivitity; a directed graph is sort-of-connected if there is some vertex which has a path to all other vertices.

Design an O(n+m) algorithm to determine whether a graph is sort-of-connected. Hint: First build the graph of strongly connected components.