CPSC 320 Notes, Playing with Graphs!

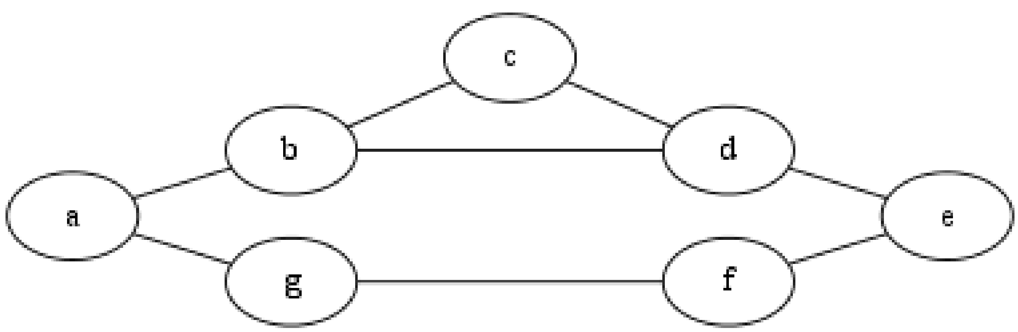
January 16, 2015

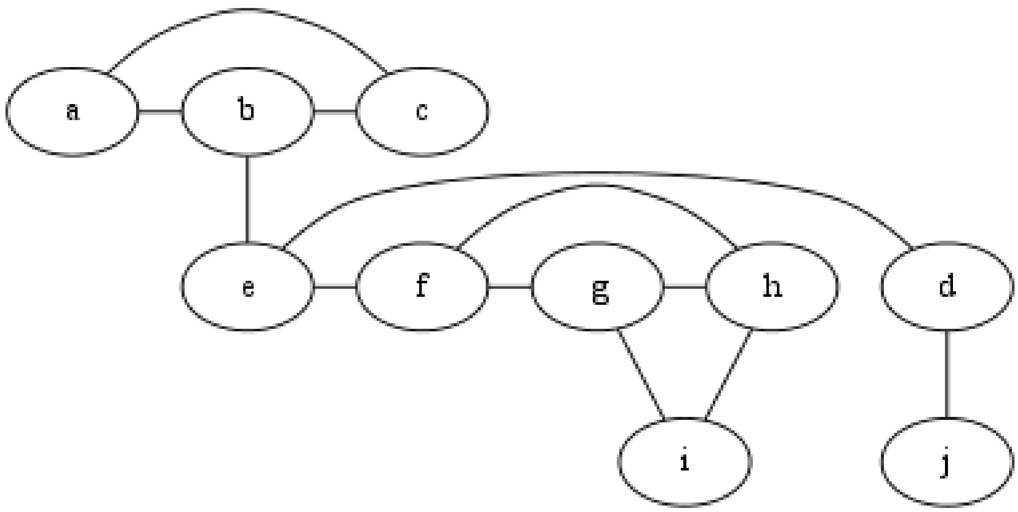
Let's practice graphs by considering two new terms: "articulation points" and "diameters".

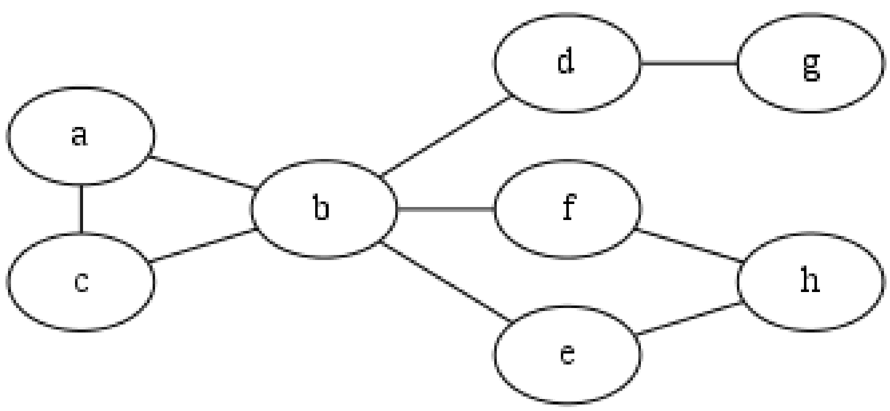
An *articulation point* in an undirected graph is a vertex whose removal increases the number of connected components in the graph. Intuitively: Consider a node in a graph. If removing that node and all edges incident on that node "breaks" the graph into pieces, then the node is an articulation point.

The *diameter* of an undirected, unweighted graph is the largest possible value of the following quantity: the smallest number of edges on any path between two nodes. In other words, it's the largest number of steps **required** to get between two nodes in the graph.

For each of the following graphs: (1) draw out the rooted tree generated by a breadth-first search of the graph from node a (draw dashed lines for edges that aren't part of the tree), (2) draw out the tree generated by a depth-first search of the graph from node a (again, using dashed lines for left-out edges), (3) find all the articulation points (if any) in the graph, and (4) give the diameter of the graph.







1 Challenge Problem

The book described the "Independent Set" problem as one where we do not know a polynomial-time solution. If we had a linear time algorithm for finding articulation points, describe how it could help (and how **much** it could help) for **some** graphs.