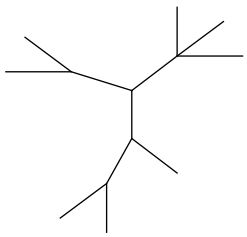
Assignment 1

1 Cut node, bipartite graph (1 P)

Which nodes of the graph depicted below are cut nodes? Is the graph bipartite?



2 Proof (4 LP)

Prove the following result: A DAG is a rooted tree if and only if it contains precisely one node of indegree 0, which is the root, and all other nodes have indegree one.

3 DAG for given traversals (5 LP)

Construct a rooted DAG with nodes labeled $a, b, \ldots, i$ such that the three traversals visit the nodes in the following order:

- preorder: $i,\ a,\ d,\ g,\ h,\ e,\ b,\ f,\ c$
- postorder: $g,\ h,\ d,\ e,\ a,\ f,\ b,\ c,\ i$
- breadth-first: $i,\ a,\ b,\ c,\ d,\ e,\ f,\ g,\ h$

Construct a second rooted DAG that gives rise to the same traversals.