



Phylogenetic networks

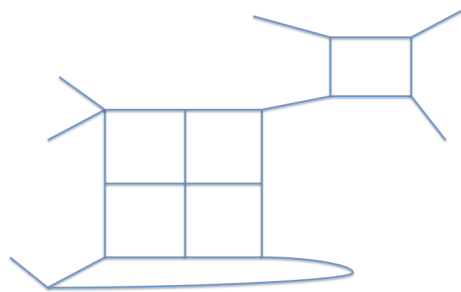
Summer 2013

Assignment 2

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1. Cut nodes and biconnected components (2 points)

What are the cut nodes and what are the biconnected components of the following graph:



2. Cut nodes (2 points)

Let G be a graph with at least two nodes. Show that G has at least two nodes that are not cut nodes.

3. Source and sink (2 points)

Let G be a DAG. A node v in G is called a *source*, if it has in-degree 0 and is called a *sink*, if it has out-degree 0. Show that every DAG has at least one source and one sink.

4. Tree lemma (4 points)

Prove the following Lemma:

Let G be a directed acyclic graph (DAG).

- (a) *If G has exactly one node of in degree 0, then G is a connected graph.*
- (b) *If all other nodes have in-degree 1, then G is a rooted tree.*

Due date: May 2, 2013