

MATH 3330 — Applied Graph Theory  
Assignment 4

*Due Tuesday, February 6, 2006 (before class)*

1. True or false: the endpoints of a cut-edge are both cut-vertices. If true, explain why. If false, give a counterexample.
2. Text, 2.4.31. Let  $v$  be one of the vertices of a connected graph  $G$ . Find an upper bound for the number of components in  $G - v$  (explain your answer), and give an example that achieves that upper bound.
3. (a) Text, 3.1.18. True or false: There exists a connected  $n$ -vertex simple graph with  $n + 1$  edges that contains exactly two cycles. If true, give an example, if false, explain why not.  
(b) Text, 3.1.19. True or false: There exists a connected  $n$ -vertex simple graph with  $n + 2$  edges that contains four edge disjoint cycles. If true, give an example, if false, explain why not.
4. Text, 3.2.16. What is the relationship between the depth of a vertex  $v$  in a rooted tree and the number of ancestors of  $v$ ? Explain your answer.
5. Do problems 4.2.3 and 4.2.10 of the text (find a dfs and bfs tree for the given graph).
6. Do problems 4.3.3 and 4.3.7 of the text (find an MST and a shortest-path tree for the given graph). Show your work.