

Homework #4, CS 329E, Spring 2008  
Due February 28, 2008

1. Suppose you are given a graph represented as an adjacency matrix. Give pseudo-code for breadth-first search, and analyze the running time.
2. Give two algorithms, one polynomial time greedy algorithm and one exhaustive search, for the following problem:
  - Input: Graph  $G = (V, E)$
  - Question: find a subset  $V_0 \subseteq V$  such that  $G - V_0$  is disconnected, and so that  $V_0$  is as small as possible.

Provide a running time analysis for each problem.

3. Consider the following problem:
  - Input: graph  $G = (V, E)$
  - Question: can we color the vertices of  $G$  with 3 colors, without coloring two adjacent vertices the same color?

Give polynomial time algorithms for this problem, one which has no false positives, and one which has no false negatives. (Note: all you have to do is answer “Yes” or “No”: you do not have to produce the 3-coloring.)