

CMPS 201
Spring 2010
Homework Assignment 8

1. (1 Point) Give an adversary argument showing that at least $\binom{n}{2}$ adjacency questions are necessary (in worst case) to determine whether a graph G on n vertices is acyclic. (Recall by “adjacency” question, we mean a question of the form: “is vertex u adjacent to vertex v ”.)
2. (2 Points) Let $b = x_1x_2x_3x_4x_5$ be a bit string of length 5, i.e. $x_i \in \{0,1\}$ for $1 \leq i \leq 5$. Consider the problem of determining whether b contains three consecutive ones, i.e. whether or not b contains the substring 111. We restrict our attention to those algorithms whose only allowable operation is to peek at a bit. Obviously 5 peeks are sufficient. A decision tree argument provides the (useless) fact that at least one peek is necessary.
 - a. (1 Point) Give an adversary argument to show that 4 peeks are necessary in general.
 - b. (1 Point) Design an algorithm which solves the problem using only 4 peeks in worst case. Express your algorithm as a decision tree.