

Name: \_\_\_\_\_

## Exercise D2, 4/8/05

### Part 1: MAX-CLIQUE

In the future, you will encounter new problems. In many cases, you will not know what the status of the problem is (unlike many school examples). So, it's good to be prepared for such a situation. Here is a new problem that is related to CLIQUE.

Let  $\text{MAX-CLIQUE} = \{(G, k) \mid \text{the largest clique of a graph } G = (V, E) \text{ has } k \text{ vertices}\}$ . Whether this problem is in NP is unknown.

- A. Explain what the underlined statement above mean.
- B. Speculate whether this problem is in NP. Try to justify.

### Part 2: 3COLOR

Knowing that a problem is in NPC is a mixed message. However, with that information, we can be prepared to deal with the problem. Until there is a conclusion, we need to live with impractical exhaustive search or some practical approximate algorithms.

Let us define a problem 3COLOR as  $\{G \mid \text{the nodes of a graph } G = (V, E) \text{ can be colored with three colors such that no two nodes joined by an edge have the same color}\}$ .

- A. Show that 3COLOR is in NP.
- B. 3COLOR is actually in NPC. Explain how you would show that it's in NPC. Note that you do *not* need to prove that 3COLOR is in NPC. However, you must identify all the necessary information that you would need to prove it.

### Part 3: Mini Research Ideas

As the first step to tackle Module D Comprehensive Exercise, you will narrow down on the topic and specific research question.

**Task:** Read the Module D Comprehensive Exercise carefully. Then, identify a mini research question which is related to the content of this course. If you feel that you have adequately solved a problem in earlier exercises, come up with a new problem to which you do not know the answer.

Survey: Time spent between classes: \_\_\_\_\_

// End