

# CSC544 Assignment #8

due Tuesday 4/10 in class

version 1.0

## Problems

1. Show that, if  $P = NP$ , then every language  $A \in P$ , except  $A = \emptyset$  and  $A = \Sigma^*$ , is  $NP$ -complete.
2. Let  $CNF_k = \{\langle \phi \rangle \mid \phi \text{ is a satisfiable cnf-formula where each variable appears in at most } k \text{ places}\}$ .
  - (a) Show that  $CNF_2 \in P$ .
  - (b) Show that  $CNF_3 \in NP$ -complete.
3. Consider the following scheduling problem. You are given a list of final exams  $F_1, \dots, F_k$  to be scheduled, and a list of students  $S_1, \dots, S_l$ . Each student is taking some specified subset of these exams. You must schedule these exams into slots so that no student is required to take two exams in the same slot. The problem is to determine if such a schedule exists that uses only  $h$  slots. Formulate this problem as a language and show that this language is  $NP$ -complete.