CS 520: Theory of Computation	Homework 4
Out: 04/03/08	**Due: 04/17/08**

Ground Rules

- **(Grading)** You will be graded on the correctness as well as clarity of your solutions. Please state and prove any assumptions or claims that you make.

- **(Collaboration)** You are allowed to discuss questions with other people in the class. However, **you must solve and write your answers yourself without any help**. You must also give explicit citations to any sources besides the textbook and class notes, including discussions with classmates.

- **(Lateness)** Late submissions do not get any credit.

- Start working on your homework early. Plan your work in such a way that you have the opportunity to put some problems on the back burner for a while and revisit them later. Good luck!

Problems

1. **(10 pts)** Prove that Post's Correspondence Problem is decidable over the alphabet $\{0\}$, but undecidable over the alphabet $\{0, 1\}$.

2. **(8 pts)** Problem 7.12 in the book (pg. 295).

3. **(8 pts)** Problem 7.17 in the book (pg. 295).

4. **(10 pts)** 2-SAT is the language of all 2-CNF formulae, i.e. formulae in which all clauses contain at most two literals, that are satisfiable. Prove that 2-SAT is in P.

5. **(14 pts)** Consider the following variations of 3-SAT.

    (a) **(2-out-of-3-SAT)** Given a 3-CNF formula, determine whether there exists an assignment that makes at least two literals in every clause true.

    (b) **(Not-all-equal-SAT)** Given a 3-CNF formula, determine whether there exists an assignment that makes at least one literal of every clause true and at least one literal of every clause false.

    Prove that one of the above problems is in P, and the other is NP-complete.