CS 577: Introduction to Algorithms	Homework 7
Out: 05/01/12	**Due: 05/08/12**

Ground Rules

Same as for homework 1.

Problems

1. **(4 points.)** Problem 8.1 in the textbook (Pg. 505).

2. **(5 points.)** An integer program is a linear program in which some variables are required to be integers. The following is an example of an integer program with optimal solution $x_1 = 1$ and $x_2 = 1$:

$$\text{maximize } 3x_1 + x_2 \text{ subject to}$$
$$2x_1 + x_2 \leq 3$$
$$3x_1 - 4x_2 \leq 1$$
$$x_1, x_2 \geq 0$$
$$x_1, x_2 \in \mathbb{Z}$$

   The decision problem for a maximization integer program is to determine whether there exists a feasible solution with objective function value at least k for some given k. Prove that this problem is NP-complete.

3. **(6 points.)** Consider the following variant of 3-SAT: Given a 3-CNF formula, decide whether there exists an assignment to the variables of the formula such that every clause contains at least one literal that is true and at least one literal that is false. Show that this problem, *Not-All-Equal-SAT (NAE-SAT)*, is NP-complete.

   (Hint: Use Circuit-SAT in your reduction and follow the proof we did in class to reduce Circuit-SAT to 3-SAT.)