Theory of Computation

Mid-Term Examination on November 8, 2011

Fall Semester, 2011

Note: You may use any result proved in teh class.

Problem 1 (30 points) It is known that 3-coloring is NP-complete. Show that 6-coloring is NP-complete. (You do not need to show that it is in NP.)

Problem 2 (30 points) Let $A \to B$ denote the set of functions from set A to set B. (a) [15 points] How many functions in $\{0,1,2,3\}^n \to \{0,1\}$ are there? (b) [15 points] How many functions in $(\{0,1,2,3\}^n \to \{0,1\}) \to \{0,1,2\}^m$ are there? (Do not write something like x^{a^b} as it is ambiguous. Write $x^{(a^b)}$ or $(x^a)^b$.)

Problem 3 (15 points) Show that if L and $\overline{L}$ are recursively enumerable, then L is recursively.

Problem 4 (25 points) Let L denote the language $\{\ M : M$ halts on all inputs $\}$. Showing L is not a recursive language, that is, membership in L is undecidable.