**COT 4210 Homework #2: Undecidability and Reducibility**
**Due Date: Monday July 9, 2012 (in class)**

1) Find a match in the following instance of the PCP: $\{\left[\frac{ab}{abab}\right], \left[\frac{b}{a}\right], \left[\frac{aba}{b}\right], \left[\frac{aa}{a}\right]\}$.

2) Show that $A_{TM}$ is not mapping reducible to $E_{TM}$.

3) Let S = { <M> | M is a TM that accepts $w^R$ whenever it accepts w}. Show that S is undecidable.

4) Consider the problem of testing whether a Turning machine M on an input w ever attempts to move its head left at any point during its computation on w. Formulate this problem as a language and show that it's decidable.

5) Let L' = {<$M_1$ , $M_2$> | $L(M_1) \subseteq L(M_2)$ }, where $M_1$ and $M_2$ are representations of Turing Machines. Show that L' is undecidable.

6) Show that the PCP is decidable over a unary alphabet, that is, over the alphabet $\Sigma = \{1\}$.

7) Show that the PCP is undecidable over a binary alphabet, that is, over the alphabet $\Sigma = \{0, 1\}$. Note: In class we proved that the PCP was undecidable over a larger, fixed sized alphabet. You may use this result in your proof.