Weekly Proof Questions (Sections 4.2, 5.1)
Assigned: 3/5/2015
Due: 3/19/2015

1) Prove that the set of ordered pairs (x, y), where x and y are positive integers are countable.

2) Prove that the subsets of the positive integers are uncountable.

3) Prove EQ_{DFA} is decidable by testing the two DFAs on all strings upto a certain size. Calculate a size that works and show why this is good enough.

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

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

6) 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.