CSE 531
Assignment 3
Due October 19, 2000

1. Consider a two-dimensional finite automaton (2D-FA) that takes as input rectangular arrays of symbols as input. The automaton has one head that can move in any of the four directions, that is, the transition function maps $Q \times \Sigma$ to $Q \times \{U, D, L, R\}$. The head can read but not write. The machine accepts by going into an accepting state. Show that the emptiness problem for 2D-FAs is undecidable. That is, determining if a 2D-FA accepts any rectangles is undecidable.

2. Now that we know the Post Correspondence Problem is undecidable we can use it as a basis for showing other problems are also undecidable. To be specific prove that the problem of given two context-free grammars G_1 and G_2 determining if $L(G_1) \cap L(G_2)$ is non-empty is undecidable. Do this by reducing PCP to this problem.