Problem Set 8 — Due February 28, 2002

Problem 1

Part A. Give the "syntax" (a something-tuple) for a two-stack, deterministic, push-down automaton (a 2S/PDA). Explain the intended meaning for your transition function.

Part B. Argue that a 2S/PDA is Turing-equivalent.

Problem 2 Classify each of the following problems as either:

— **decidable**: I see how to decide this language.

— **r.e.**: I don't see how to decide this language, but I can see a procedure to accept this language;

— **co-r.e.**: I don't see how to decide this language, but I can see a procedure to accept the complement of the language;

— **neither**: I don't see how to accept this language nor its complement.

You don't need to justify your answers (you just have to get the same answers as me!).

Part A. $\{\langle M\rangle : M \text{ is a TM that accepts some string of prime length}\}$.

Part B. $\{\langle M\rangle : M \text{ is a C-program that halts on } \langle M\rangle\}$.

Part C. $\{\langle G\rangle : G \text{ is a CFG and } G \text{ accepts an odd-length string}\}$.

Part D. $\{\langle M\rangle : M \text{ is a TM and } M \text{ has 150 states}\}$.

Part E. $\{\langle M\rangle : M \text{ is a TM and } L(M) = L(M)^*\}$.

Part F. $\{\langle M\rangle : M \text{ is a TM and } L(M) = \emptyset\}$.

Part G. $\{\langle M\rangle : M \text{ is a TM and } L(M) \text{ is r.e. }\}$.

Part H. $\{\langle G_1, G_2\rangle : G_1 \text{ and } G_2 \text{ are CFGs and } L(G_1) = L(G_2)\}$.

Part I. $\{\langle M\rangle : M \text{ is a TM and } M \text{ will visit state } q_{25} \text{ when run on some input } x\}$.