6.045J/18.400J: Automata, Computability and Complexity	T.A. Matthew Lepinski

Recitation 8: P and NP

April 10, 2003 — *Discussion Problems*

Problem 1: Prove or Disprove: All Regular Languages are in P.

Problem 2: Give a language in NP. Prove that your language is in NP.

Problem 3: Give a language not in NP. Why is your language not in NP?

Problem 4: Prove that NP is closed under intersection.

Problem 5: Show that if $P = NP$, then there exists a polynomial time algorithm which on input a graph, G, outputs a valid 3-coloring of G or else outputs $\perp$ if G is not 3-colorable.

Problem 6: Show that given any Turing Machine that decides L in time $2f(n)$, there exists another Turing Machine that decides L in time $f(n)$. (This provides evidence that "Big-O" is the right way to think about running times).