6.045J/18.400J: Automata, Computability and Complexity Prof. Ron Rivest

Homework 5

Due: 20 March 2002

Problem 1: [**Undecidability via counting argument**] Problem 4.21

Problem 2: [**Undecidability via reduction**] Problem 5.12

Problem 3: [**Undecidability via reduction**] Consider a new model of a Turing machine which allows, in addition to the standard operations, a new operation: "explode." When the Turing machine executes this operation it literally explodes, creating a huge mess.

It would certainly be desirable to be able to test a Turing machine to see whether or not it would explode. Formulate this problem as a language, and show that it is undecidable. (Note: this is exactly the same as Problem 5.16, where "explode" is substituted for "writes on the second tape.")

Problem 4: [**Post correspondence problem I**] Problem 5.17. (Hint: for each tile, consider the difference between the number of characters on the top and the number of characters on the bottom.)

Problem 5: [**Post correspondence problem II**] Problem 5.18