

600.271 Automata & Computation Theory
Assignment 7
Due April 5, 2012

I. Problem Set 6 (pages 135-6), Problem 6: (a), (d), (f), (g). (Hint: Reduce PCP to (a), and for every other problem reduce the blank tape halting problem to that problem.)

II. What is wrong with the following argument? We reduce the halting problem to the problem of given a, b, c whether $c = a + b$. A typical instance of the halting problem is $[M], x$, and a typical instance of the new problem is three values a, b, c . Given $[M]$ and x , we transform them to elements a, b, c s.t. TM M halts on input x iff $c = a + b$. Given $[M], x$, we first generate three elements 1, 2, 4. Then we start simulating M on x . If M halts then we change the third element to 3 and halt. Note that if M halts then we generate 1, 2, 3, and $3 = 2 + 1$. If M doesn't halt then we generate 1, 2, 4, and $4 \neq 1 + 2$. Hence the transformation is correct. Hence the problem of testing $c = a + b$ is undecidable. But we know that this problem is decidable.