CS 321H
Thursday 4 Feb

Homework #4

Examples of Recognizers / Acceptors / Rejectors

1. Do **Ex. 1.9** in the Notes.
2. Show that each of the following sets has a recognizer.
   (a) the Prime Numbers
   (b) the Fibonacci Numbers
   (c) Syntactically correct Pascal programs
   (d) Tautologies in the Propositional Calculus
3. Show that the following sets have acceptors.
   (a) Perfect numbers
   (n is *perfect* if the sum of ALL the divisors of n add up to $2n$.
   6 has divisors 1,2,3,6 which add up to 12.)
   (b) "elementary" functions whose integrals are "elementary" functions
   (c) programs which print all the works of Shakespeare
   (d) theorems of a formal system
   (e) Composite numbers
4. Show that the following sets have rejectors.
   (a) Programs which only output prime numbers
   (b) Programs which never Halt on any input
   (c) Non-perfect numbers
   (d) Diophantine equations which have NO solution
5. Show that the set of Fibonacci numbers is Primitive Recursive.
   (i.e. Give a primitive recursive program that takes x as input and outputs **YES** if x is a Fibonacci number and outputs **NO** if x is not a Fibonacci number.)
6. Use the **diagonal** argument to show that there is a SET which is not Primitive Recursive.
   Can you show that your SET is Recursive?
   (What do you need to know about primitive recursive programs to show that SET is Recursive?)