COMP 314 Homework Assignment 3

1. (8 points) For each of the four statements below, indicate whether the statement is provable and/or true in each of the logical systems defined in the reading, by placing checkmarks in the tables below.

   (a) "`1+1=10`":

	provable?	true?
BinAdLogic		
BrokenBinAdLogic		
RestrictedBinAdLogic		
FixedBinAdLogic		

   (b) "`1+1+10=11`":

	provable?	true?
BinAdLogic		
BrokenBinAdLogic		
RestrictedBinAdLogic		
FixedBinAdLogic		

   (c) "`101010=101000+10`":

	provable?	true?
BinAdLogic		
BrokenBinAdLogic		
RestrictedBinAdLogic		
FixedBinAdLogic		

   (d) "`1+100=1+1+1+1+1`":

	provable?	true?
BinAdLogic		
BrokenBinAdLogic		
RestrictedBinAdLogic		
FixedBinAdLogic		

2. (5 points) Give a mechanical proof of the statement "`1+100=1+1+1`" in the logical system FixedBinAdLogic.

3. (5 points) Consider the statement "Python program `P.py` outputs ASCII string S on input I." Do you think this statement can be converted into an equivalent statement of Peano Arithmetic? (As in class, "equivalent" means that the Peano Arithmetic statement has the same truth value as the original statement.) Briefly explain why or why not.

4. (a) (3 points) Use some brief web research to find out about the uses of theorem-proving by computers. Describe an interesting application in two or three sentences.

   (b) (3 points) What, if any, are the implications of Gödel's First Incompleteness Theorem for the use of theorem-proving in the application you described in question 4a? Give a brief answer in one or two sentences; careful reasoning is not required.