Homework #8

#1 <u>True or False</u>

a) A two-way infinite tape Turing Machine is more powerful than a one-way infinite tape Turing Machine   TRUE   FALSE
b) The complement of a regular language is recursively enumerable   TRUE   FALSE
c) Turing Machines are the most powerful model of computation known today
                                                               TRUE   FALSE
d) Nondeterministic Turing Machines are more powerful than deterministic Turing Machines   TRUE   FALSE
e) Turing machines are finite state machines   TRUE   FALSE

#2. Consider the following Turing Machine, M:

State	B	0	1	2
q_0	(q_1,B,R)	-	-	-
q_1	(q_1,B,R)	$(q_1,0,R)$	$(q_1,1,R)$	$(q_2,2,L)$
q_2	-	$(q_2,1,L)$	$(q_2,0,L)$	-

a) Trace the computation for the input string: 01201
b) Trace the first 6 transitions of the computation for the input string: 0101
c) Draw the state diagram of M
d) Describe the result of a computation in M

#3. Construct a Turing Machine to accept strings containing the same number of 0's as 1's.

   a) Show pseudo-code that describes how the TM operates
   b) Create the actual transitions
   c) Show your TM processing (i) 1001 and (ii) 101

#4. Create a Turing machine to compute the function: $f(n) = 2n + 3$

#5. Prove: Recursive languages are closed under complement. This is a direct (and simple) proof, not an induction.