Name____________________

Homework #6

I worked with:

I consulted:

#1. M is the Turing machine:

δ	B	a	b	c
q_0	q_1,B,R			
q_1	q_1,B,R	q_1,a,R	q_1,b,R	q_2,c,L
q_2		q_2,b,L	q_2,a,L	

a) Trace the computation of *abcab*
b) Trace the computation of *abab*
c) Draw the graph for M
d) What does M do?

#2. a) Construct a Turing machine with alphabet {0,1} to compute f(n) = 2n. Represent numbers in unary notation; that is, 0 is represented by a *1* on the tape, 1 by *11*, 2 by *111*. (So if n = 3, you would be left with seven 1's on the tape etc.). Have your Turing machine halt in the configuration: q_f B f(n) B. Show a computation for f(3).

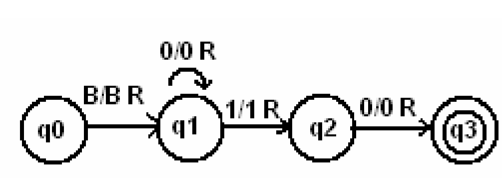
b) Construct a Turing machine with alphabet {0,1} to compute f(n) = n *monus* m defined by:

$$n \text{ monus } m = \begin{cases} n - m & \text{if } n \geq m \\ 0 & \text{otherwise} \end{cases}$$

Show computations for 3 monus 1 and 1 monus 3.

3. Create a Turing machine to accept the language: a(a ∪ b)* b

#4. Given the following Turing machine,



a) What is L(M)
b) Show R(M) using the encodings of Section 11.5 (discussed in class)

#5. Construct a Turing machine in words (i.e, describe its moves without actually writing all the transitions) that determines whether a string over {0,1} is the encoding of a Turing machine (Step 1 of the Universal Turing Machine).