

## Homework #13

**Question 1.** Make a Turing Machine  $M$  which accepts all strings of the form  $xa$ , halts and rejects all strings of the form  $xab$ , and loops forever on all strings of the form  $xbb$ . (I don't care what happens if the input has less than 2 letters.)

**Question 2.** Write proofs that the set of recursive languages is closed under unions and intersections. (Your proof should be similar, but not exactly the same as, one we did in class- make sure it's not exactly the same.)

**Question 3.** Write a proof that the set of recursive languages is closed under complements. Explain specifically why this proof does not work for RE languages.

**Question 4.** Prove that: If  $L$  is RE but not recursive, then the complement  $\bar{L}$  is not RE. *Hint:* Do this proof by contradiction. So you will assume that  $L$  is RE but not recursive (say what that means in terms of algorithms for  $L$ ), and also assume that  $\bar{L}$  is RE (say what that means in terms of algorithms for  $\bar{L}$ ), and explain why these two things are contradictory.