Homework #9

1. (4 Points) **True or False**

a. Recursive languages are closed under complement TRUE FALSE
b. Every language can be recognized by a Turing machine TRUE FALSE
c. The membership question for recursive languages is decidable TRUE FALSE
d. The membership question for context-free languages is decidable TRUE FALSE

#1 (5 Points)List 2 decidable problems about regular languages, 2 about context-free languages and 2 about recursive languages. Jot down how they might be decided.

#2. (10 Points) Prove that there is no algorithm that determines whether an arbitrary Turing machine halts when run with the input string 101.

#3. (5 Points) List 2 undecidable problems about regular languages, 2 about context-free languages and 2 about r.e. languages. Provide a reference to the justification.

#4. (5 Points) Prove: L and $\overline{L}$ are recursively enumerable (re) if and only if L is recursive.

#5. (10 Points) Show that recursive languages are closed under union, intersection, complementation, concatenation, and *.

#6. (4 Points) Show that re languages are closed under union, intersection, concatenation and *.

#7. (4 Points) Show that re languages are not closed under complementation (hint: see #5)

#8 (3 Points) Post to the bb the implications in CS of

a) undecidability
b) closure properties of recursive languages