

## Homework #9

### 1. (10 Points) True or False

- a. Subproblems of the Halting Problem are undecidable TRUE FALSE
- b. Rice's Theorem can be used to show that  $L = \{0,1\}^*$  is decidable TRUE FALSE
- c. Recursively enumerable languages are closed under intersection TRUE FALSE
- d. The membership question for recursively enumerable languages is decidable TRUE FALSE
- e. The membership question for recursively enumerable languages is decidable TRUE FALSE

### #2. (20 Points)

- a) List 2 decidable problems about regular languages and explain why they are decidable.
- b) List 2 undecidable problems about regular languages, 2 about context-free languages and 2 about r.e. languages. Provide a reference to the justification. You needn't prove they are undecidable.

#3. (10 Points) Prove that there is no algorithm that determines whether an arbitrary Turing machine prints the symbol "1" on its final transition.

#4. (10 Points) a) (5 points) Label each concentric ring with one of the following languages:

- i) context-free ii) non recursively-enumerable iii) recursive
- iv) recursively enumerable v) regular. The concentric rings are intended to show the subset property.
- b) For each concentric circle, name a language which is in the outer circle (including outside), but not in the inner circle.

