

## Homework 7

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### Problem 1

- a.  $\{ \langle s \rangle \mid s \text{ is a string and } |s| \text{ is less than } 128 \}$
- b.  $\{ \langle A \rangle \mid A \text{ is a DFA and } A \text{ accepts at least one string} \}$
- c.  $\{ \langle A \rangle \mid A \text{ is a DFA and } A \text{ accepts the empty string} \}$
- d.  $\{ \langle B \rangle \mid B \text{ is an NFA and the language of } B \text{ is not empty} \}$
- e.  $\{ \langle C \rangle \mid C \text{ is a regular expression and } C \text{ does not generate a specific string} \}$
- f.  $\{ \langle D \rangle \mid D \text{ is a Turing machine and } D \text{ loops indefinitely} \}$
- g.  $\{ \langle D \rangle \mid D \text{ is a Turing machine and } D \text{ moves the tape head in the left direction} \}$
- h.  $\{ \langle D, E \rangle \mid D \text{ and } E \text{ are two Turing machines and } D \text{ and } E \text{ recognize the same language.} \}$
- i.  $\{ \langle D, E \rangle \mid D \text{ and } E \text{ are two Turing machines and } D \text{ and } E \text{ always halt and always leave the same output on the tape for any given input string} \}$

### Problem 2

- a. Completed already on assignment sheet.
- b. Create a DFA where when it gets any input it goes to a dead state. This DFA is a decider for the language from 1(c).
- c. Do the same as in part b but start with an NFA that does the same and then convert to DFA. It will look the same.
- d. Construct a Turing machine based off of machine P in theorem 4.4. If P accepts then reject and otherwise accept.
- e. ?