

## PROBLEM SET 1

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1. Let  $L = \{w \in \{0, 1, 2\}^* \mid w \text{ represents an integer in ternary that is divisible by } 7\}$ . Draw a **DFA** for  $L$ . Also include the transition table / function.
2. Let  $\Sigma = \{\#, !\}$ . Let  $L = \{\#^k u \#^k \mid u \in \Sigma^* \text{ and } k \geq 1\}$ . Show that  $L$  is regular.
3. Construct an **NFA** that is **NOT a DFA** for the following language over  $\Sigma = \{\mathbf{a}, \mathbf{b}\}$ :

$$L = \{w \mid w \in \Sigma^* \text{ and } |a| \text{ in } w \text{ is a multiple of } 3\}$$

4. Convert your NFA from the previous question into a **DFA**. Make sure you show **each** step clearly.
5. If  $w$  is a string then  $SUFFIX(w)$  is all strings you can form by replacing all preceding symbols up to a symbol in  $w$  with the empty string. If  $L$  is a language,  $SUFFIX(L)$  is defined in a similar way.

- Give a definition of the language  $SUFFIX(L)$  in the form

$$SUFFIX(L) = \{w \mid w \in \Sigma^* \text{ and } \dots\}.$$

- Prove or disprove that if  $L$  is a regular language then  $SUFFIX(L)$  is also regular.