

1. [5 pts] Write the formal English description of each set described by the regular expression below. Assume alphabet  $\Sigma = \{0, 1\}$ .

A)  $1^*01^*$

$L = \{a \mid \text{where } a \text{ contains exactly one '0' in the string}\}$

B)  $(\Sigma\Sigma\Sigma)^*$

$L = \{b \mid \text{the length of } b \text{ string can be divided by 3}\}$

C)  $(0\Sigma^*0) \cup (1\Sigma^*1) \cup 0 \cup 1$

$L = \{c \mid c \text{ is either a single character, or starts \& ends with 0, or starts \& ends with 1}\}$

D)  $0^* \cup 1^*$

$L = \{d \mid d \text{ contains only '0's or only '1's but not both}\}$

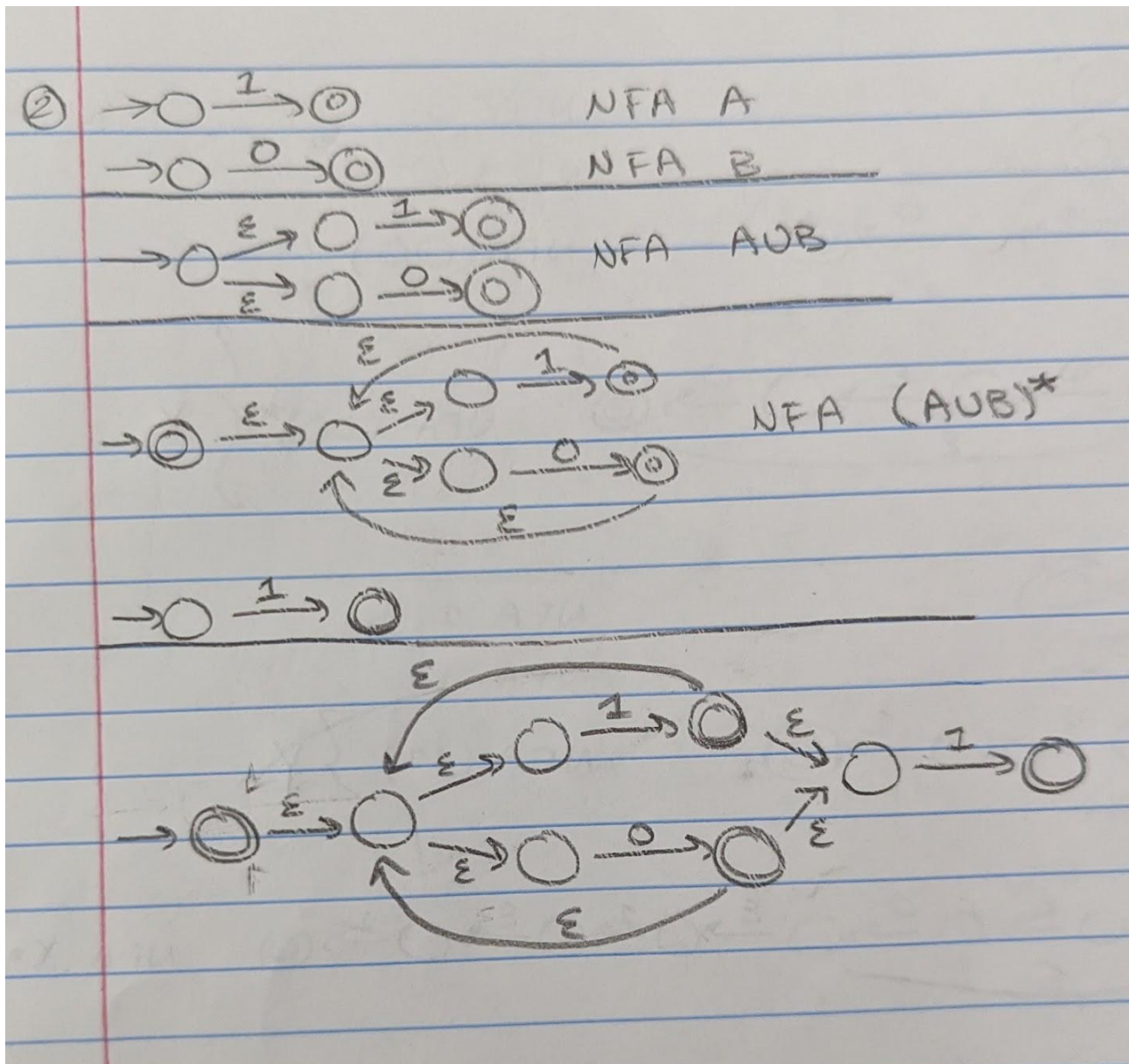
E)  $(10)^+(\Sigma \cup \varepsilon)$

$L = \{e \mid e \text{ begins with the substring '10' at least once and then possibly followed by some character}\}$

Go down

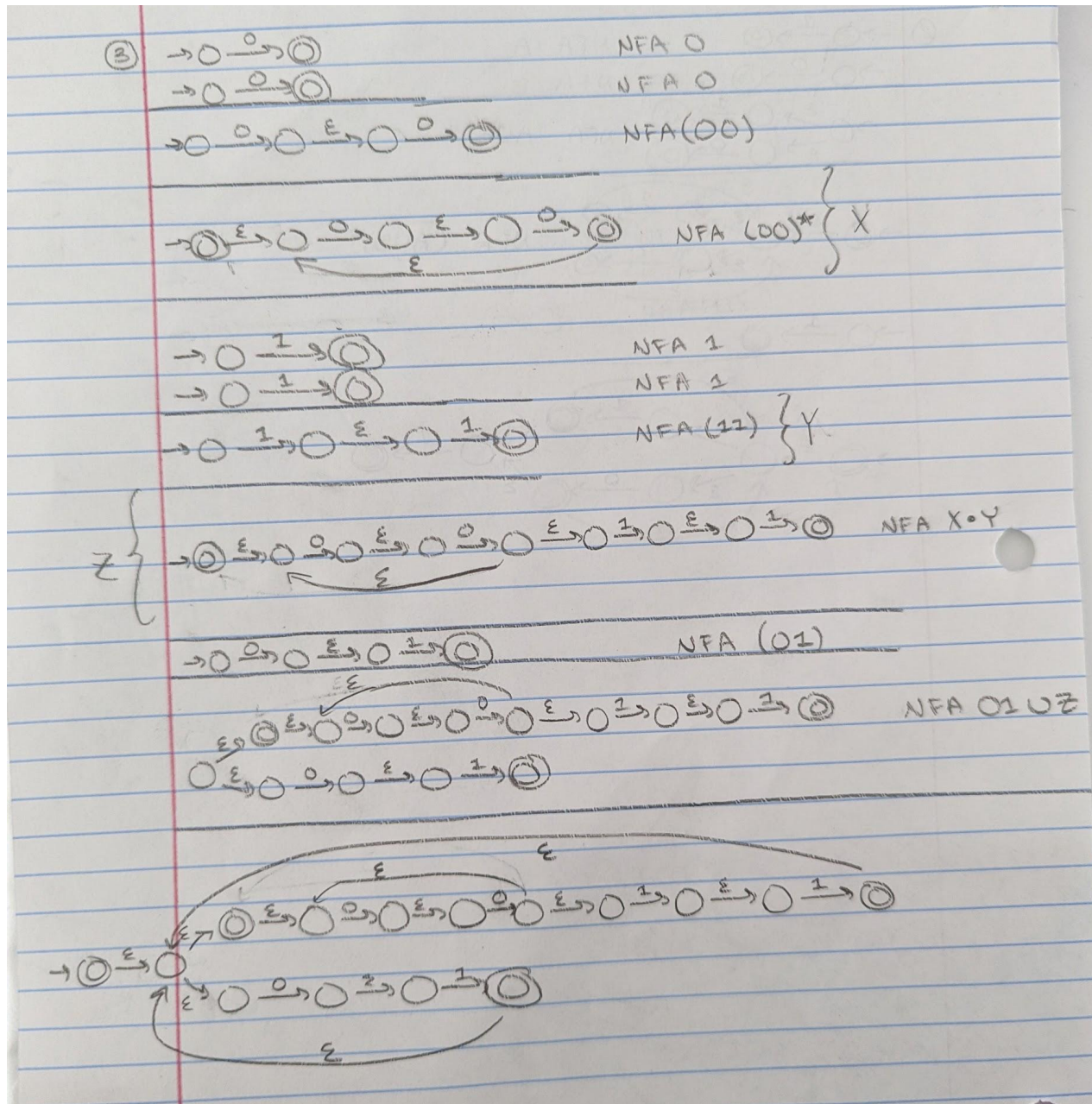
vvvvvvvvvvvvvvvvvv

2. [5 pts] Let  $\Sigma = \{0, 1\}$ , use the procedure described in class to convert the following RE into an NFA. Show step-by-step construction and no simplification.  
 $(0 \cup 1)^*1$



3. [5 pts] Use the procedure described in Lemma 1.55 (textbook pp.88) to convert the following RE into an NFA. Show step-by-step construction.

$((00)^*(11) \cup 01)^*$



4. [5 pts] Use the procedure described in Lemma 1.60 (textbook pp.90) to convert the following DFA into a regular expression. Eliminate states in the order of  $q_2$ ,  $q_0$  and  $q_1$ . Assume alphabet  $\Sigma = \{a, b\}$ .

