Problem type 1:

Provide a infinite fooling set for the following problem:

(See variants below)

You must show why it is a fooling set (mainly by showing that for any two elements in the fooling set, there is a suffix that makes them distinguishable). Assume $\Sigma = (\mathtt{0}, \mathtt{1})$

a. **BYB**

$L = \{\mathtt{0}^a \mathtt{1}^a \mathtt{0}^a | a \geq 0\}$

b. **BYA**

$L = \left\{\mathtt{0}^a \mathtt{1} \mathtt{0}^b | 0 \leq a \leq b\right\}$

c. **BYC**

$L = \left\{\mathtt{0}^a \mathtt{1}^b \mathtt{0}^c \mathtt{1}^d | a + c = b + d\right\}$

d. **BYG**

$L = \{w \mathtt{1} w | w \in \Sigma^*\}$

Problem type 2:

For the following language, please state whether it is *regular*, or ***not*** *regular*.

(See variants below)

If the language is regular prove it by writing down a regex/DFA/NFA that represents the language. If the language is not regular, provide a infinite fooling set. You must show why it is a fooling set (mainly by showing that for any two elements in the fooling set, there is a suffix that makes them distinguishable). Assume $\Sigma = (\mathtt{0}, \mathtt{1})$.

a. **BYF**

   $L = \left\{\mathtt{0}^a\mathtt{0}^b | 0 \leq a \leq b\right\}$

b. **BYH**

   $L = \{xw | x, w \in \Sigma^* \text{ and } x \neq w\}$

c. **BYE**

   $L = \{w\mathtt{1}x | w, x \in \Sigma^* \text{ and } w \neq x\}$

d. **BYD**

   $L = \left\{\mathtt{0}^a\mathtt{1}\mathtt{0}^b | 0 \leq a \leq b\right\}$