Warmup 1: FAs and REs

[ about $\frac{3}{4}$ length of actual test ]

1. For the alphabet \{x, y, z\},
   let $L$ be the language of nonempty strings $w$ such that
   $w$ starts with the symbol $x$ and contains exactly one $y$, or
   $w$ starts with the symbol $y$ and ends with the symbol $z$, or
   $w$ starts with the symbol $z$ and the total length is odd. Give an FA for $L$.

2. Give an RE for the set of all binary strings of odd length whose first and last bits are the same.
   $$0\Sigma^*(\Sigma\Sigma)^*0 + 1\Sigma^*(\Sigma\Sigma)^*1 + 0 + 1$$

3. Give an RE for the complement of the language defined by the following RE: $(01)^*$
   $$1\Sigma^* + \Sigma^*0 + \Sigma^*00\Sigma^* + \Sigma^*11\Sigma^*$$

4. Consider the following FA.

(a) Give two strings of length 4 accepted by the FA.
(b) Give two strings of length 4 NOT accepted by the FA.
(c) Describe in succinct-ish English the language of this FA. Be precise.
   $$\text{Alphabet} = \{a, b\} \quad \text{Must start with } a \quad \text{and except for last symbol must alternate.}$$