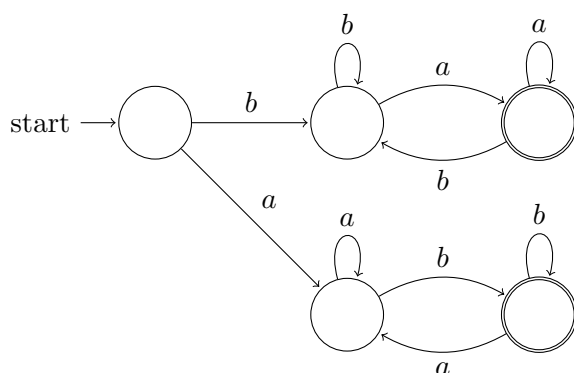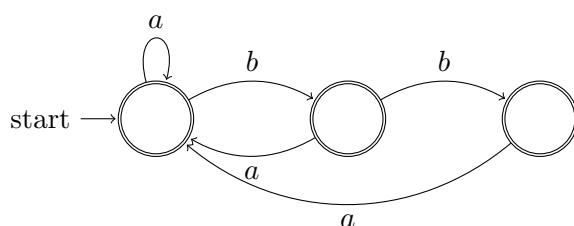In the past, I required these to be submitted, with the explicit understanding that these would be graded solely on effort. This quarter, I am not collecting them at all. I encourage you to do these just the same.

1. Are the following functions Injective, Surjective, Both (bijective), or Neither? Remember, for any such questions in this class, unless indicated otherwise, you need to justify your answer.

   - f: students in this class $\rightarrow$ ID numbers, where $f(x) =$ the student's ID number.
   - $f : \mathbf{R} \rightarrow \mathbf{Z}$, where $f(x) = \lfloor x \rfloor$.
   - $f : \mathbf{Z} \rightarrow$ even integers, where $f(x) = 2x$.

2. Design a DFA over the alphabet $\Sigma = \{a, b\}$ that accepts all strings with an even number of instances of the letter a and an odd number of instances of the letter b.

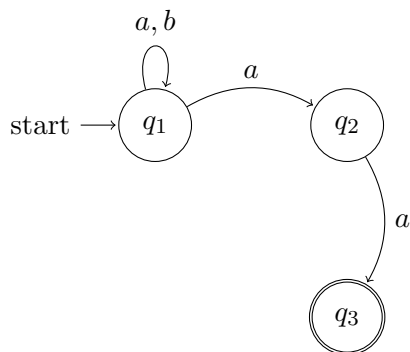3. Give a simple English description of the language recognized by the following machine:

4. Give a simple English description of the language recognized by the following NFA:

There are more questions on the next digital page...

5. Here's an NFA. Use the subset construction mechanism from lecture to produce an equivalent DFA. The alphabet is $\Sigma = \{a, b\}$.

6. Draw an NFA that recognizes strings from the alphabet $\Sigma = \{a, b\}$ in which there is a pair of letter a that are separated by an odd number of consecutive bs. The strings *may* have other letters – it is not merely a single pair of a separated by the correct number of bs.

7. Draw an NFA that recognizes strings from the alphabet $\Sigma = \{a, b\}$ that contain the substring *abab* or *bbbab* or both.