Describe deterministic finite-state automata that accept each of the following languages over the alphabet $\Sigma = \{0, 1\}$. Describe briefly what each state in your DFAs means. Yes, these are exactly the same languages that you saw last Friday.

Either drawings or formal descriptions are acceptable, as long as the states $Q$, the start state $s$, the accept states $A$, and the transition function $\delta$ are all be clear. Try not to use too many states, but don’t try to use as few states as possible.

1. All strings containing the substring $000$.
2. All strings not containing the substring $000$.
3. All strings in which every run of $0$s has length at least 3.
4. All strings in which all the $1$s appear before any substring $000$.
5. All strings containing at least three $0$s.
6. Every string except $000$. [Hint: Don’t try to be clever.]

**Work on these later:**

7. All strings $w$ such that in every prefix of $w$, the number of $0$s and $1$s differ by at most 1.
8. All strings containing at least two $0$s and at least one $1$.
9. All strings $w$ such that in every prefix of $w$, the number of $0$s and $1$s differ by at most 2.

*10. All strings in which the substring $000$ appears an even number of times.
(For example, $0001000$ and $0000$ are in this language, but $00000$ is not.)