Describe a deterministic finite-state automata (DFA) that accept each of the following languages over the alphabet $\Sigma = \{0, 1\}$. Describe briefly what each state in your DFAs means.

Version: 1.0

- 1 All strings containing the substring 000.
- 2 All strings *not* containing the substring 000.
- 3 All strings in which every run of 0s has length at least 3.
- 4 All strings in which no substring 000 appears before a 1. (Equivalently: All strings in which every substring 000 appears after every 1.)
- 5 All strings containing at least three 0s.
- 6 Every string except 000. (Hint: Don't try to be clever.)

Work on these later:

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