For each of the following languages over the alphabet $\Sigma = \{0, 1\}$, either prove the language is regular (by giving an equivalent regular expression, DFA, or NFA) or prove that the language is not regular (using a fooling set argument). Exactly half of these languages are regular.

- 1. $\{\mathbf{0}^n \mathbf{10}^n \mid n \ge 0\}$
- 2. $\{0^n 10^n w \mid n \ge 0 \text{ and } w \in \Sigma^*\}$
- 3. $\{w \mathbf{0}^n \mathbf{10}^n x \mid w \in \Sigma^* \text{ and } n \ge 0 \text{ and } x \in \Sigma^*\}$
- 4. Strings in which the number of 0s and the number of 1s differ by at most 2.
- 5. Strings such that *in every prefix*, the number of **0**s and the number of **1**s differ by at most **2**.
- 6. Strings such that *in every substring*, the number of **0**s and the number of **1**s differ by at most 2.