You should solve the homework on your own. Don’t use any books or the internet.

Problem 1. Describe how to traverse all strings in \( \{0, 1\}^n \) in such a way that each step changes \( n \) or \( n - 1 \) bits, alternately.

Problem 2. Given a partially ordered set \((\mathcal{P}, \leq)\), define a graph \(G = (\mathcal{P}, E)\) where \((x, y) \in E\) if \(x < y\) or \(y < x\). Prove if \(k\) is the maximum size of a clique in \(G\), then \(G\) is \(k\)-colorable.

Problem 3. Suppose that \(\mathcal{F} \subseteq 2^{[n]}\) is a family of sets not containing any triple of sets such that \(A \subset B \subset C\). Prove that the number of sets in \(\mathcal{F}\) is at most \(\left(\begin{array}{l}n \\ \lfloor n/2 \rfloor \end{array}\right) + \left(\begin{array}{l}n \\ \lceil n/2 \rceil \end{array}\right)\).