(1) Exercise 8.1-3 from the textbook.

(2) Exercise 34.5-1 from the textbook.

(3) Prove that the following problem SET COVER is NP-complete: Given a ground set (or “universe”) $U$ of $n$ elements, and $m$ sets $S_1, S_2, \ldots, S_m \subseteq U$, find the smallest collection of these sets covering all of $U$. That is, find the smallest set $C \subseteq \{1, \ldots, m\}$ such that $\bigcup_{i \in C} S_i = U$. First phrase the problem as an equivalent decision problem, and then prove the decision problem NP-complete.

(4) Prove that the following problem SET PACKING is NP-complete. Given $m$ sets $S_1, S_2, \ldots, S_m$, find as many of these sets as possible such that no selected pair of sets intersects. That is, find the largest set $C \subseteq \{1, \ldots, m\}$ such that for all $i, j \in C$, we have $S_i \cap S_j = \emptyset$. First phrase the problem as an equivalent decision problem, and then prove the decision problem NP-complete.