Problem numbers are from the second edition of Sipser’s book. If unsure about which problem to solve, ask. Collaboration is permitted; looking for solutions from external sources (books, the web, material from previous years, etc.) is prohibited.

1. 5.9
   \( (w^R \text{ is the reverse of } w) \)

2. 5.22

3. 5.25 (Hint: 5.24)

4. Prove that the following language is undecidable:
   \[
   A = \{ \langle M \rangle : M \text{ is a TM that runs in polynomial time} \}.
   \]

5. 7.13

6. Let \( coNP \) be the class of languages whose complement is in \( NP \). Show that \( P \subseteq NP \cap coNP \). Show that if \( P = NP \) then \( P = coNP \).
   (Warning: \( coNP \) is not the complement of \( NP \).)