

## Homework 2 Practice Problems

Below is a set of practice problems on designing and proving the correctness of greedy algorithms, to help you check your understanding of the approach we've discussed in class. If you want even more practice problems, those problems and exercises marked "A" in the textbook have answers at the end of the chapter.

You can find solutions to these problems at the end of the chapter. We're also willing to listen to you describe your solutions or to look at your writeups during office hours.

*Note:* If you want to discuss these problems, I expect you to give correctness arguments just as on the actual homework.

## Practice Problems

- Sipser 1.29(1.29i) (a),(c)
  - Sipser 1.46(1.51i) (b)
- Give examples of pairs of languages satisfying the following properties. Whenever you claim a language is nonregular, prove it. Whenever you claim a language is regular, prove it constructively by giving a regular expression or FA that accepts it.
  - Find two non-regular languages whose union is regular.
  - Find two non-regular languages whose intersection is both infinite and regular.
  - Find a non-regular language  $L$  for which  $L^*$  is regular.
- Characterize all the equivalence classes of the language

$$L = \{0^n 1^n \mid n \geq 0\}$$

over the alphabet  $\Sigma = \{0,1\}$ . Show that each pair of classes you give is distinct, and that they collectively cover all of  $\Sigma^*$ . Why does your result prove that  $L$  is not regular?