Homework 7

Due: 25 March 2025

v20250321-1215

Problem 7.1 — theoretical

Consider the following languages, all over the alphabet $\Sigma = \{a, b, c\}$. For each, prove that it is a regular language or prove that it is not a regular language.

a. All strings starting with a where every group of one or more a is followed by either exactly one b or exactly one c.

b. All strings where every group of one or more c is preceded by a longer group of either a or b.

c. All strings where every group of one or more b is preceded by exactly one a and followed by exactly one c (and a and c only occur when bracketing groups of b in this fashion).

Problem 7.2 — theoretical

Consider the language L specified by the following BNF grammar. (The numbers on the left are line numbers for convenience and not part of the grammar itself.)

1. $L \rightarrow 0$
2. $L \rightarrow BL$
3. $L \rightarrow LB$
4. $L \rightarrow 0L$
5. $L \rightarrow L0$
6. $B \rightarrow \epsilon$
7. $B \rightarrow 0B1$
8. $B \rightarrow 1B0$

For each of the following strings, use the grammar to show that the string is part of the language L.

a. 10000

b. 0010101

c. 0011100

You probably want to do this one on paper. If you prefer to type it up, you can hand it in using the handin script:

```
handin cmsc208 hwk7 myfile.pdf
```

(If it's LaTeX you can hand in the `.tex` file(s) but if you make it in anything else please convert to PDF before handing in so I don't have to chase down how to get it printed.)

Collaboration policy: group work! If you work with other people on this homework, you can just hand in one copy and put all your names on top. There will be a revision cycle for this.