

HOMEWORK FOR LECTURE
AUTOMATA AND FORMAL LANGUAGES II

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HOMEWORK SHEET 2

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Aufgabe 2.1. [Even Height] (10 points)

Let $\mathcal{F} = g/1, a/0$. Is the language $L = \{t \in T(\mathcal{F}) \mid \text{height}(t) \text{ is even}\}$ regular?

Now let $\mathcal{F} = f/2, g/1, a/0$. Is the language $L = \{t \in T(\mathcal{F}) \mid \text{height}(t) \text{ is even}\}$ regular?

Give tree automata for the languages or prove non-regularity!

Note $\text{height}(t)$ is the height of a tree. It can be defined as

$$\text{height}(f(t_1, \dots, t_n)) = \max\{\text{height}(t_1), \dots, \text{height}(t_n)\} + 1$$

where $\max(\emptyset) := 0$.

Aufgabe 2.2. [Implementation Exercise] (10 points)

Implement, in your favorite programming language, a program that does the following:

- Read a tree automaton and a tree from standard input (format specified below).
- Decide whether the automaton is deterministic.
 - If no, output an error.
 - If yes, output whether the tree is accepted

Example file:

```
F: a/0, f/2, g/1 # Alphabet
Q: q1,q2         # States
Qf: q1          # Final states
Rules:          # Rules
  a -> q1
  f(q1,q1) -> q1, f(q2,q2) -> q2
  g(q1) -> q2, g(q2) -> q2
Term: f(f(g(a),a),a) # The term to be recognized
```

Item type followed by colon (:). Items separated by comma (,) or newline. Ignore any additional whitespace. Alphanumeric identifiers, comments with hash (#) until end of line. You may assume that the automaton is well-formed.

Submit the source code and instructions how to compile and run by email to lammich at in tum de.