KUTAISI INTERNATIONAL UNIVERSITY

Exercises for TTF

Introduction to Theory of Computation
Summer semester 2025

Exercises below are your homework; after submission, they will also be discussed during exercise classes.

Week 12

1. Prove Lemma 3 from the lecture on Gödels incompleteness theorems. That is, show that

Lemma 3. *If the proof system S is sound and complete, then the set*

$$T = \{w \in L \mid w \text{ is true}\}$$

is decidable.

2. Show that $u = p^{|y|}$ can be defined in L_E as

$$\text{“}u \text{ is a power of } p\text{”} \wedge y < u \wedge u \leq p \cdot y.$$

3. Convince yourself that Horner Scheme from the proof of Gödel's Incompleteness Theorem does what it is supposed to (TCS-13, slide 23).

4. (*) Let L by accepted by a nondeterministic finite automaton. Show that there is a statement $R(w)$ in L_E which is true if and only if $w \in L$.