Languages, automata and computation II
Homework 2

Problems: deadline XX/12/2024

Problem 1. A *parametric finite weighted automaton* is a finite weighted automaton where the initial vector, the final vector, and the transition matrices can contain one parameter x (interpreted in the field of rational numbers). Formally, their entries are univariate polynomials in $\mathbb{Q}[p]$. Show that the set of rational number values for the parameter x s.t. the automaton has the zero semantics has measure either 0 or 1.

Problem 2. A series $f : \Sigma^* \to \mathbb{Q}$ is *commutative* if $f(u) = f(v)$ for all words $u, v \in \Sigma^*$ s.t. u and v are permutations of each other. Show that the following problem is decidable: We are given a weighted finite automaton A and we need to decide whether the rational series recognised by A is commutative.

Problem 3.