



ALEXEI FEST

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Model theory and algebraic geometry in groups and algebras

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12:30–1:45pm

Abstract:

We consider some fundamental model-theoretic questions that can be asked about a given algebraic structure (a group, a ring, etc.), or a class of structures, to understand its principal algebraic and logical properties. These Tarski type questions include: elementary classification and decidability of the first-order theory.

In the case of free groups we proved (in 2006) that two non-abelian free groups of different ranks are elementarily equivalent, classified finitely generated groups elementarily equivalent to a finitely generated free group (also done by Sela) and proved decidability of the first-order theory.

We describe partial solutions to Tarskis problems in the class of free associative and Lie algebras of finite rank and some open problems. In particular, we will show that unlike free groups, two free associative algebras of finite rank over the same field are elementarily equivalent if and only if they are isomorphic. Two free associative algebras of finite rank over different infinite fields are elementarily equivalent if and only if the fields are equivalent in the weak second order logic, and the ranks are the same. We will also show that for any field the theory of a free associative algebra is undecidable.

These are joint results with O. Kharlampovich.