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By Philipp Rothmaler



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Model theory investigates mathematical structures by means of formal languages. So-called first-order languages have proved particularly useful in this respect.

This text introduces the model theory of first-order logic, avoiding syntactical issues not too relevant to model theory. In this spirit, the compactness theorem is proved via the algebraically useful ultraproduct technique (rather than via the completeness theorem of first-order logic). This leads fairly quickly to algebraic applications, like Malcev's local theorems of group theory and, after a little more preparation, to Hilbert's Nullstellensatz of field theory.

Steinitz dimension theory for field extensions is obtained as a special case of a much more general model-theoretic treatment of strongly minimal theories. There is a final chapter on the models of the first-order theory of the integers as an abelian group. Both these topics appear here for the first time in a textbook at the introductory level, and are used to give hints to further reading and to recent developments in the field, such as stability (or classification) theory.



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