Abstract

Our aim of the project was to understand the structure of finite dimensional Lie algebras and their representations. We begin with the basic definitions of Lie algebras, as given in the book, Lie algebras by Nathan Jacobson, and understand the concepts by solving the exercises from the book. In Chapter 2, we state and prove Levi's radical splitting theorem and Malcev-Harish Chandra's theorem on the conjugacy of the semi-simple subalgebras of finite-dimensional Lie algebras over a field of characteristic zero. In chapter 3, we define the concept of the universal enveloping algebras of a Lie algebra and prove the PBW theorem. The latter gives a basis of the universal enveloping algebra of a Lie algebra. We use it to understand the induced representations of the finite-dimensional Lie algebras over field of characteristic zero.