

*The Workshop on
Computational Differential Algebra and Related Topics, June 21-25, 2014
School of Mathematics, IPM, Tehran*

An Introduction to Finite Dimensional Lie Theory

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We review some basic material from the theory of finite dimensional Lie algebras over complex field. We concentrate on the semisimple theory and discuss how the notion of a Cartan subalgebra reduces the study of Lie algebras to the study of corresponding root systems, as far as the classification is concerned. In this direction we emphasize on some related concepts such as fundamental systems (simple roots), positive systems, Cartan matrices and Dynkin diagrams. We give a brief outline of the classification of finite root systems and its relation to the classification of finite dimensional complex (semi-)simple Lie algebras. We also explain how roots play a role in representation theory of semi-simple Lie algebras. Some simple examples are provided.

References

1. J. E. Humphreys, Introduction to Lie algebras and representation theory, Springer, 1972.
2. R. Carter, Lie algebras of finite and affine type, Cambridge Univ. Press, 2005. 1