

Seminar on Representations of Kac-Moody Lie algebras.

Joseph Bernstein

September 16, 2005

Description of the seminar topics.

Background topics

1. Simple finite dimensional Lie algebras.
Root system, Weyl group, simple roots
2. Theory of highest weight representations of simple Lie algebras: Verma modules, Weyl character formula, Shapovalov's formula.

Kac-Moody Lie algebras

3. Kac-Moody Lie algebras and their highest weight representations.
4. Invariant bilinear form and Casimir operator.
5. Integrable representations. Kac-Weyl character formula. Kac-Kazhdan generalization of Shapovalov's formula.
6. Affine Lie algebras and their integrable representations.
7. Unitarizability.

Applications

8. Eta function identities.
9. Sugawara construction of the action of Virasoro algebra.
Classification of unitary representations of Virasoro algebra.

Additional topics

10. Kac-Moody groups and their flag varieties.
11. Basics of Vertex operator algebras.