

Syllabus Math 513 (Lie theory)

Prof: C. Negron

Time and Location: MWF 1:00–1:50, DMC 259

Text: Humphreys *Introduction to Lie algebras and representation theory*

Office Hours: Fridays (but not both, on any given week)

Website: c-negron.github.io/513.F24

Prerequisites

Math 510A, 510B.

Course description

The course provides an introduction to the representation theory of semisimple Lie algebras over the complex numbers. Topics include the classification of semisimple Lie algebras via Dynkin diagrams and weight systems, descriptions of semisimple Lie algebras via their Cartan and Borel subalgebras, and the classification of representations for semisimple Lie algebras via dominant weights.

Homework and Tests

Homework will be essentially biweekly, and turned in in class. Most problems will be out of Humphreys's text. Homework will be posted on the course website. There will be a single final exam. Students will complete a written project, or provide an oral presentation, for the final.

Grades

The final grade will be calculated as 90% homework and 10% final.

Outline

Representations of $\mathfrak{sl}_2(\mathbb{C})$ [some # of weeks]

→ Representations of $\mathfrak{sl}_n(\mathbb{C})$ [some # of weeks]

→ Algebraic groups and $SL_n(\mathbb{C})$ -reps [1.5 weeks?]

→ Humphreys: solvable, nilpotent, Engel

→ Humphreys: Cartan, the Killing form, and semisimplicity

→ Humphreys: Root systems and classification

→ Verma modules, dominant weights, and constructing all simple reps

Statement on Academic Conduct and Support Systems

Academic Conduct

Plagiarism – presenting someone else's ideas as your own, either verbatim or recast in your own words – is a serious academic offense with serious consequences. Please familiarize yourself with the discussion of plagiarism in SCampus in Part B, Section 11, "Behavior Violating University Standards" policy.usc.edu/scampus-part-b. Other forms of academic dishonesty are equally unacceptable. See additional information in SCampus and university policies on scientific misconduct, policy.usc.edu/scientific-misconduct.

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