Textbook references for lectures and notes on Combinatorial Lie Representation Theory
Rob Donnelly April 14, 2006

COMBINATORICS

Richard P. Stanley *Enumerative Combinatorics, Volume I*, Wadsworth and Brooks/Cole, Monterey, California, 1986.

Richard P. Stanley *Enumerative Combinatorics, Volume II*, Cambridge University Press, Cambridge, 1999.

These two volumes (particularly Volume I and Chapter 7 of Volume II) contain precise definitions and standard results about most of the combinatorial notions that come up in my work.

ALGEBRA (LIE ALGEBRAS, GROUP THEORY, ETC)

David S. Dummit and Richard M. Foote *Abstract Algebra*, Prentice-Hall, New Jersey, 1991.

A good reference for basic graduate-level algebra on topics ranging from group theory, ring theory/modules, vector spaces and linear algebra, and representation theory.

William Fulton and Joe Harris *Representation Theory: A First Course*, Springer-Verlag, New York, 1991.

This is a very useful resource for understanding the connection between the study of Lie group representations and Lie algebra representations. This was a principle reference for the first lecture on examples of Lie algebras and for the notes on Lie groups.

Kenneth Hoffman and Ray Kunze *Linear Algebra*, 2nd ed., Prentice-Hall, New Jersey, 1971.

This is a standard reference for graduate-level linear algebra, which shows up occasionally in the notes (use of Sylvester's Theorem in classifying non-degenerate symmetric bilinear forms; a space has a non-degenerate skew-symmetric bilinear form only if it has even dimension; etc).

James E. Humphreys *Introductions to Lie Algebras and Representation Theory*, Springer-Verlag, New York, 1972.

This is a standard reference for basics about Lie algebra representations. Chapter 17 of this text was a primary resource for the discussion of the universal enveloping algebra, free Lie algebras, and generators and relations. Chapters 20 and 21 contain most of the basics about highest weight theory of irreducible modules for semisimple Lie algebras.

James E. Humphreys *Reflection Groups and Coxeter Groups*, Cambridge University Press, Cambridge, 1990.

A good reference for definitions and basic results about reflection groups, Coxeter groups, Weyl groups (and "crystallographic groups"), and various classifications (e.g. classification of finite reflection groups, finite Weyl groups, etc).

Victor Kac *Infinite Dimensional Lie algebras*, 3rd ed., Cambridge University Press, Cambridge, 1990.

Kac describes his development of a generalization of the representation theory of finite-dimensional semisimple Lie algebras to a class of infinite-dimensional Lie algebras now called Kac-Moody Lie algebras.

Shrawan Kumar *Kac-Moody Groups, Their Flag Varieties, and Representation Theory*, Birkhäuser, Boston, 2002.

Kumar was on my thesis committee at the University of North Carolina at Chapel Hill. For me this is primarily useful for the exposition in the early chapters on basics about Kac-Moody Lie algebras and Weyl groups. It's a nice alternative to Kac.

DIFFERENTIAL GEOMETRY / LIE GROUPS

Lawrence Conlon *Differentiable Manifolds*, 2nd ed., Birkhäuser, Boston, 2001.

Frank Warner *Foundations of Differentiable Manifolds and Lie Groups*, Springer-Verlag, New York, 1971.

I think I like this better than Conlon as a reference, but both were helpful particularly for the Lie groups notes.

TOPOLOGY

William S. Massey *A Basic Course in Algebraic Topology*, Springer, New York, 1991.

Another useful reference for facts about fundamental groups and covering spaces.

James R. Munkres *Topology: A First Course*, Prentice-Hall, New Jersey, 1971.

A standard reference for basic graduate-level topology, which shows up occasionally in the notes (fundamental group of the circle; covering spaces; etc).