HOMEWORK ASSIGNMENTS

IAP 2014: DIRECTED READING PROGRAM

The problems are borrowed from [1]. Therefore, we will only indicate their numbers.

- *Lecture 1:* Representations of finite groups.
  Exercises: 1.3, 1.4, 1.12, 1.13, 1.14.

- *Lecture 2:* Characters.
  Exercises: 2.3, 2.4, 2.7, 2.25, 2.27, 2.29, 2.33, 2.34, 2.35, 2.36, 2.37, 2.38, 2.39.

- *Lecture 3:* Induced representations and group algebras.
  Exercises: 3.2, 3.4, 3.8, 3.11, 3.16, 3.19, 3.26, 3.38, 3.39, 3.40, 3.42, 3.43, 3.44.

- *Lecture 4:* Representations of S_n.
  Exercises: 4.4, 4.6, 4.13, 4.16, 4.19, 4.20, 4.24, 4.40, 4.43, 4.44, 4.47, 4.51, 4.52.

- *Lecture 5.1:* Representations of A_n.
  Exercises: 5.2, 5.4, 5.5.

- *Lecture 5.2:* The character table of $\mathrm{GL}_2(\mathbb{F}_q)$ and $\mathrm{SL}_2(\mathbb{F}_q)$ (**optional**).
  Exercises: 5.7, 5.9, 5.10.
  Additional homework: work out all calculations from this section.

- *Lecture 6:* Schur-Weyl duality and Schur functors.
  Exercises: 6.4, 6.10, 6.11, 6.13, 6.16, 6.17(a), 6.18, 6.21, 6.29, 6.30, 6.31.

- *Lecture 7:* Lie groups.
  Exercises: 7.1, 7.2, 7.3, 7.6, 7.8, 7.11, 7.13, 7.14, 7.16, 7.17.

- *Lecture 8:* Lie algebras and Lie groups.
  Exercises: 8.1, 8.10, 8.17, 8.24, 8.28, 8.29, 8.35, 8.36, 8.40, 8.43, 8.44.
  Additional homework: work out details in the proof of the Campbell-Hausdorff formula.

- *Lecture 9:* Initial classification of Lie algebras.
  Exercises: 9.1, 9.2, 9.5, 9.7, 9.8, 9.10, 9.21, 9.22, 9.24.

- *Lecture 11:* Representation theory of $\mathfrak{sl}_2$.
  Exercises: 11.11, 11.14, 11.17, 11.19, 11.23, 11.25, 11.33, 11.36.

- *Lecture 14:* General structure theory of semisimple Lie algebras.
  Exercises: 14.14, 14.28, 14.33, 14.34, 14.35, 14.36.

- *Lecture 21:* Classification of complex simple Lie algebras.
  Exercises: 21.6, 21.8, 21.15, 21.17, 21.18.

- *Lecture 24:* Weyl character formula.
  Exercises: 24.4, 24.7, 24.20, 24.23, 24.27, 24.31, 24.43, 24.49, 24.50.

- *Appendix C:* On complete irreducibility and Jordan decomposition.
  Exercises: C.1, C.13, C.14, C.28.

- *Appendix D:* On the Cartan subalgebras and the Weyl group.
  Exercises: D.5, D.24, D.30, D.35, D.38, D.41.

- *Appendix E:* Ado's and Levi's theorems (**optional**).

[1] W. Fulton and J. Harris, *Representation Theory: A First Course.*