Student seminar "Commutative Algebra"
Heidelberg University, Winter Semester 2024

Contact: Andrea Conti, contiand@gmail.com

Time and place: Planned for Wednesdays, 9-11am.

Vorbesprechung: Tuesday, October 8, 10-11am, in Room 3.414, INF205.

Prerequisites: Algebra 1 and 2 courses.

Requirements: Talks should be in English and 90 minutes long. The student giving the talk is required to prepare a handout.

Description: Commutative algebra, or the study of commutative rings, is a central ingredient in modern algebraic geometry and number theory. In this seminar we will treat some advanced topics in this field, such as faithfully flat ring extensions, primary decompositions, Hilbert's Nullstellensatz and Noether normalization, regular rings, the theory of dimension, and time permitting we will introduce Cohen–Macaulay and Gorenstein rings.

Most of the material will be contained in the classical texts of Atiyah—MacDonald [AM16] and Matsumura [Mat80; Mat89], but many additional sources can be used as a complement, sometimes with a more geometric flavour, such as Eisenbud's book [Eis95]. The theories of Cohen–Macaulay and Gorenstein rings are well covered by the text of Bruns–Herzog [BH98].

References

[AM16] M. F. Atiyah and I. G. Macdonald. *Introduction to commutative algebra*. economy. Addison-Wesley Series in Mathematics. Westview Press, Boulder, CO, 2016, pp. ix+128.

[BH98] Winfried Bruns and H. Jürgen Herzog. *Cohen-Macaulay rings*. Vol. 39. Cambridge Studies in Advanced Mathematics. Cambridge University Press, 1998.

[Eis95] David Eisenbud. *Commutative algebra*. Vol. 150. Graduate Texts in Mathematics. With a view toward algebraic geometry. Springer-Verlag, New York, 1995, pp. xvi+785. ISBN: 0-387-94268-8; 0-387-94269-6.

[Mat80] Hideyuki Matsumura. *Commutative algebra*. Second. Vol. 56. Mathematics Lecture Note Series. Benjamin/Cummings Publishing Co., Inc., Reading, MA, 1980, pp. xv+313. ISBN: 0-8053-7026-9.

[Mat89] Hideyuki Matsumura. *Commutative ring theory*. Second. Vol. 8. Cambridge Studies in Advanced Mathematics. Translated from the Japanese by M. Reid. Cambridge University Press, Cambridge, 1989, pp. xiv+320. ISBN: 0-521-36764-6.