D-MATH
HS 2019
Prof. E. Kowalski

Examination rules

Commutative Algebra

The exam lasts 30 minutes, and it will be split roughly in two parts of equal duration and importance.

(**1**) For the first part, the student picks three of the topics from those listed below, one from each sublist (e.g., localization, integral extensions, completion is OK, but localization, base change, DVR is not). When you come in the room, the professor will ask what these three topics are, and will select one of them. The student should then start presenting this topic (definitions, examples, statements, ideas of proofs, etc). Further questions about this topic (including asking for more examples, for ideas of a proof, etc) are possible.

(**2**) For the second part, there will be questions about any topic covered in the class (not counting the exercises), and (mostly) about topics that were not part of the list of three topics in Part 1. This might include questions about definitions, examples, theorems, sketches of proofs, etc, but it will be in general less technical and detailed than the questions for the first part.

In both parts, it is expected that the students write reasonably complete sentences on paper to explain their answers. In particular, statement of theorems should be completely precise.

List 1. Localization
Noetherian modules and rings
Local rings
Tensor product of modules
Base change
Exact sequences and exactness

List 2. Dimension of a ring, height of an ideal
Artinian modules and rings
Modules of finite length
Integral extensions
Cohen-Seidenberg theorems
Krull's Principal Ideal Theorem
Transcendental extensions

List 3. Noether Normalization
Dimension and height for finitely-generated algebras over fields
Nullstellensatz / Zariski's Theorem
Associated primes
Primary decomposition
Discrete valuation rings
Completion