

Math 825
Introduction to Schemes and the
Cohomology of Coherent Modules

Spring Semester, 2006

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Preliminary Announcement, November 3, 2005

Synopsis

In a manner that is reminiscent of the way a sphere may be pieced together from overlapping disk images, a *scheme* may be pieced together from *affine schemes*. An affine scheme is the geometric guise of a commutative ring with unity. Specific case: if k is a field, its n -dimensional affine space \mathbf{A}^n_k is the geometric guise of the polynomial ring $k[x_1, \dots, x_n]$, while its n -dimensional projective space \mathbf{P}^n_k is a non-affine scheme that may be pieced together using overlapping copies of \mathbf{A}^n_k .

While every scheme is locally affine, a scheme embodies global information that may not easily be discerned simply by viewing it as a union of affine schemes. The cohomology of coherent modules encodes much global geometric information. In the case of an affine scheme a coherent module is the same thing as a finitely-generated module over the ring associated with the affine scheme, and the cohomology of a coherent module is trivial.

Text

Algebraic Geometry Robin Hartshorne, Springer (Graduate Texts in Mathematics), ISBN 0387902449

Prerequisites

The course is intended to complement Math 725 as offered during the fall semester of 2005.

Formal Prerequisites The core courses in algebra, Math 520 A & B. General topology, Math 540A.

Helpful Topics for Background Many things, while not formally necessary, may provide helpful motivation including commutative algebra, homological algebra, algebraic curves, and algebraic topology.