COURSE ANNOUNCEMENT: SUMMER 2008
MATH 724, TOPICS IN COMMUTATIVE ALGEBRA: ALGEBRAIC GEOMETRY

MTWThF 1:30-3:00 PM, 06/10/08-08/01/08, Minard Hall 306, 3 credits
No text required, notes from http://www.math.utah.edu/~bertram/courses/alggeo/
Prerequisite: MATH 721

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Course Description: Algebraic geometry is the study of algebraic varieties, that is, geometric objects defined as solutions to polynomial equations. For instance, we have the "nodal" curve C given by the equation $y^2-x^2(x+1)=0$:

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In[6]:= ImplicitPlot[y^2 - x^2 (x + 1) == 0, {x, -1, 1}, {y, -1, 1}];
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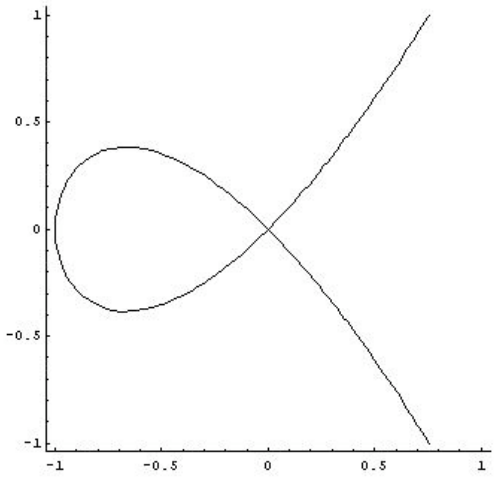

We study algebraic varieties with a combination of algebraic and geometric methods. On the algebraic side, the main object of study is the coordinate ring of the variety. The ring-theoretic properties of this ring encode geometric information about the variety. For example, the coordinate ring of the nodal curve C is the quotient ring

$$\mathbf{R}[C]=\mathbf{R}[x,y]/(y^2-x^2(x+1)).$$

This ring has Krull dimension 1, reflecting the 1-dimensional nature of the curve.

We will spend the semester exploring the geometric properties of algebraic varieties and the algebraic properties of their coordinate rings.

Tentative course outline:

1. Introduction, Linear Algebra, Two Theorems of Hilbert, Fields, Complex Tori
2. Categories, Sheaves, Products
3. Affine Varieties, The Nullstellensatz, Abstract Varieties, Projective Varieties, Dimension, Differentials