Queen's Algebraic Geometry — Seminar —

The Jacobian ideal of the binary discriminant

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Abstract

Consider a degree d binary form $F = a_0x^d + a_1x^{d-1}y + \cdots + a_dy^d$, where the a_i are complex numbers. There is a polynomial $\Delta_F(a_0, \ldots, a_d)$ called the discriminant of F with the following property: F has a repeated linear factor iff $\Delta_F = 0$. Consider its *Jacobian ideal*

$$J = \left(\frac{\partial \Delta_F}{\partial a_0}, \ldots, \frac{\partial \Delta_F}{\partial a_d}\right) \subseteq \mathbb{C}[a_0, a_1, \ldots, a_d]\,.$$

The group $SL_2(\mathbb{C})$ acts on binary forms by a change of variables, and everything above is natural with respect to this action. The main result of the talk is that J is a perfect ideal of codimension two. Its SL_2-equivariant minimal resolution can be explicitly described; this implies *inter alia* that Δ_F satisfies a system of algebraic differential equations with quadratic coefficients. This is joint work with Carlos D'Andrea from University of California, Berkeley.

Monday, March 14, 2005
2:30pm – 3:30pm
422 Jeffery Hall