

A Normal Form for Quartic Curves

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As pointed out by Geiser in 1869 [1], the theory of cubic surfaces with 27 lines is related to the theory of quartic curves with 28 bitangents. Namely, to every cubic surface with 27 lines and any point on the surface but on no line, there is associated a quartic curve with 28 bitangents. We will utilize this well-known relation to derive a normal form for smooth quartic curves. We will also provide explicit descriptions of the 28 bitangents. Several examples will be worked out, including the classical unital which arises from an example over the field with nine elements. We include some comments on how to compute isomorphisms between finite varieties, as well as automorphism groups of such varieties.

Keywords: quartic curve, finite field, computer algebra

References

- [1] Geiser. Ueber die Doppeltangenten einer ebenen Curve vierten Grades. *Math. Ann.*, 1(1):129–138, 1869.