Some applications of Algebraic Geometry to the search of invariant algebraic curves

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The Darboux Theory of Integrability considers the existence of a collection of invariant algebraic curves of a differential system. Afterwards, a convenient linear combination of the cofactors of these curves leads to the expression of a Darboux first integral.

This is just an example where the existence of invariant algebraic curves is important. The main difficulty lays in finding such algebraic curves. We shall see how the Theory of Singularities of Algebraic Geometry is, in some special cases, very useful for obtaining such curves and we shall show its application to Darboux Theory of Integrability.