

986-57-151

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Cluster algebras and Poisson Geometry.

A cluster algebra of rank n is a commutative ring generated inside its ambient field by a certain distinguished family of generators called cluster variables. These generators are obtained from some initial cluster by an explicit "mutation" process. Coordinate rings of such varieties, as, for instance, Bruhat cells in flag varieties and Grassmanians possess cluster algebra structures.

We introduce a notion of Poisson bracket and closed differential 2-form on R^n compatible with the cluster algebra structure and describe all such Poisson brackets and 2-forms.

Generic symplectic leaves of the compatible Poisson structure make a manifold, whose number of connected components equals to the number of orbits of some linear group acting on a vector space over field of 2 elements. We are able to compute these numbers in some particular cases. For instance, we obtained the number of connected components in a double Bruhat cell.

We hope that these objects shed some light on cluster algebra axioms.

(Received February 14, 2003)