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*On some questions around Berest's conjecture*

Berest's conjecture about orbits in the first Weyl algebra states that the number of orbits of solutions of a polynomial equation  $F(X, Y) = 0$  in the first Weil algebra, where  $F$  is an irreducible polynomial over a field of characteristic zero, is finite, if the arithmetic genus of the corresponding plane curve is  $> 1$ , and is infinite otherwise. This conjecture is closely related to the theory of commuting ordinary differential operators, as well as with the well-known Dixmier conjecture on endomorphisms of the first Weyl algebra. Several recent works were devoted to testing this conjecture in some special cases. Although in the various studied examples this conjecture turns out to be false, it is still interesting for further study, especially over the field  $\mathbb{Q}$ . In my talk I will review the already known as well as recently obtained together with Junho Guo results around this hypothesis.

SCIENTIFIC SEMINAR  
"DIFFERENTIAL GEOMETRY AND APPLICATIONS"

headed by Academician of RAS Anatoly T. Fomenko

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