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### *Differential invariants for the actions of algebraic groups and pseudogroups and their applications in classical invariant theory and geometric theorem of differential equations*

The problem of studying orbit spaces  $\Omega/G$  for actions  $G : \Omega$  of groups  $G$  on spaces  $\Omega$  is one of the most important problems, which has a lot of different applications in many areas (representation theory, geometry, differential equations, etc.). Most of the cases of this problem fall into two groups:

- $\Omega$  is a smooth manifold and  $G$  is a Lie group (geometric situation);
- $\Omega$  is an algebraic manifold and  $G$  is an algebraic Lie group, acting algebraically on  $\Omega$  (algebraic situation).

We present new approaches to study such problems. These approaches are based on the differential invariants and geometric theory of differential equations on the one hand and on algebraic geometry and classical invariant theory on the other hand. So we study the connection between two different areas of mathematics: geometry of differential equations and algebraic geometry.

The main results of the work are the following:

- 1) Fields of differential invariants for a linear action of an algebraic group  $G$  on the space of complex homogeneous forms of many variables are described, and regular  $G$ -orbits of this action are classified.
- 2) Basic differential invariants and invariant derivations for the action of a semisimple algebraic group  $G$  in its irreducible representation are constructed, regular  $G$ -orbits are described, and an equivalence criterion is obtained.
- 3) Contact and point classifications of various classes of ordinary differential equations are constructed, and their algebras of differential invariants are calculated.
- 4) A point classification of contact vector fields on the 1-jet space is obtained.
- 5) Various subgroups in the group of bi-rational contact maps of the 1-jet space are described.
- 6) Effective and global classifications in various problems of the geometric theory of differential equations are constructed.

#### SCIENTIFIC SEMINAR

#### “DIFFERENTIAL GEOMETRY AND APPLICATIONS”

headed by Academician of RAS Anatoly T. Fomenko

The seminar takes place online in ZOOM on Mondays  
from 4:45 p.m. to 6:20 p.m. (Moscow time)

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