September 30, from 4:45 p.m. to 6:20 p.m. (Moscow time)
room 16-10 and broadcast via ZOOM

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Geometry of Lie groups. Riemann and Ricci tensors and geometric normal forms of Lie algebras

In the context of the previously discovered duality between the left-invariant metric and the Lie algebra of right automorphisms, the main objects characterizing geometry are considered. These are Riemann and Ricci tensors of left-invariant metrics on a Lie group. It is shown that they are expressed in a multilinear way through the coefficients of the differential forms defining the metric, and are in fact determined by a certain constant tensors.

In this regard, the concept of a geometrically normal form of a Lie algebra is introduced: an algebra is defined in a geometrically normal form if the matrices of coefficients defining the metric form and the Ricci tensor are unit and diagonal, respectively. For an arbitrarily Lie algebra of right automorphisms and an arbitrary left-invariant metric the reduction to a geometrically normal form actually consists in reducing two quadratic forms to a sum of squares: first, by linear transformations of the basis in the Lie algebra, the metric form is reduced to a sum of squares with unit coefficients, and then, by rotations of this basis, the Ricci tensor is reduced to a sum of squares (in this case, the coefficients of the squares are the principal curvatures). It turns out that for three-dimensional Lie algebras there are only two geometrically normal forms, each of which is determined by three parameters related, in a general situation, to the principal curvatures.

SCIENTIFIC SEMINAR
"DIFFERENTIAL GEOMETRY AND APPLICATIONS"

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