ON INVARIANT SOLUTIONS OF THE FIVE-DIMENSIONAL LIOUVILLE EQUATION

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Liouville equations arise in tasks of differential geometry, theory of nonlinear waves, quantum fields theory and etc. (see, for example, [1] and references therein). In 1853 year Liouville has constructed the general solution for two-dimensional Liouville equation. In [2, 3] the symmetry reduction is performed and some multiparametrical families of exact solutions for three-dimensional Liouville equation are constructed.

The symmetry reduction of the Liouville equation in the Minkowsky space $R_{1,n}$ is done in [4]. In this paper some classes of exact solutions for this equation are also constructed.

Let us consider the following five-dimensional Liouville equation

$$\frac{\partial^2 u}{\partial x_0^2} - \frac{\partial^2 u}{\partial x_1^2} - \frac{\partial^2 u}{\partial x_2^2} - \frac{\partial^2 u}{\partial x_3^2} - \frac{\partial^2 u}{\partial x_4^2} = e^u, \ u = u(x_0, x_1, x_2, x_3, x_4). \tag{1}$$

This equation is invariant with respect to the generalized Poincaré group $P(1,4)$. The group $P(1,4)$ is a group of rotations and translations of the five-dimensional Minkowski space $M(1,4)$.

By now, we perform the symmetry reduction of the equation (1) and construct some classes of its invariant solutions, using the subgroup structure of the group $P(1,4)$ and invariants of its nonconjugate subgroups.

In my talk I plan to present some of the results obtained.

References

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[4] Barannik A.F. *Reduction of the Liouville equation in the Minkowski space* $R_{1,n}$ // Dokl. Akad. Nauk Ukrain. SSR Ser. A. – 1990. – no. 7. – P. 3–6, 87.