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VERIFICATION OF AN ANALYTICAL ANTIDERIVATIVES FORMS USING CORRELATION ANALYSIS FOR MECHANICAL PROBLEMS

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An analytical search for antiderivative functions (indefinite integrals) is widely used in the mathematical simulation of various engineering, economic, ecological, biological, social, and other processes. In their turn, mechanical problems have many subproblems whose solution involves analytical integration methods. Among these problems is the problem of development of analytical models for navigation and ballistics support and control theory models in space rocket engineering. The advantage of this approach to mathematical simulation is a fast analysis of the state of dynamic systems on different time intervals without calculating all previous states.

In their turn, for some classes of functions, antiderivatives may be found in several different ways, as a result of which there exist several different forms of antiderivatives that are hard to verify by the classical method in standard form. This is mainly due to the choice of various combinations of integration methods used in the development of analytical models, in particular in problems of applied mechanics.

Taking into consideration these difficulties in the verification of the set of antiderivative functions, this paper proposes a method to check their analytical forms for correspondence with the use of correlation analysis. In doing so, the arrays of the values of each antiderivative form at certain nodal points are represented as a set of random variables. With this in mind, it is suggested that the verification process be conducted with the use of the standard approach based on correlation analysis (using Pearson's correlation coefficient). The efficiency of the method is shown by the example of verifying the antiderivatives of the reciprocal of a squared quadratic trinomial. This approach will make it possible to check the adequacy of the *i*-th candidate antiderivative and to adapt the problem to the standard form.

Keywords: *antiderivative, verification method, correlation analysis, analytical model, mechanics, integration*

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