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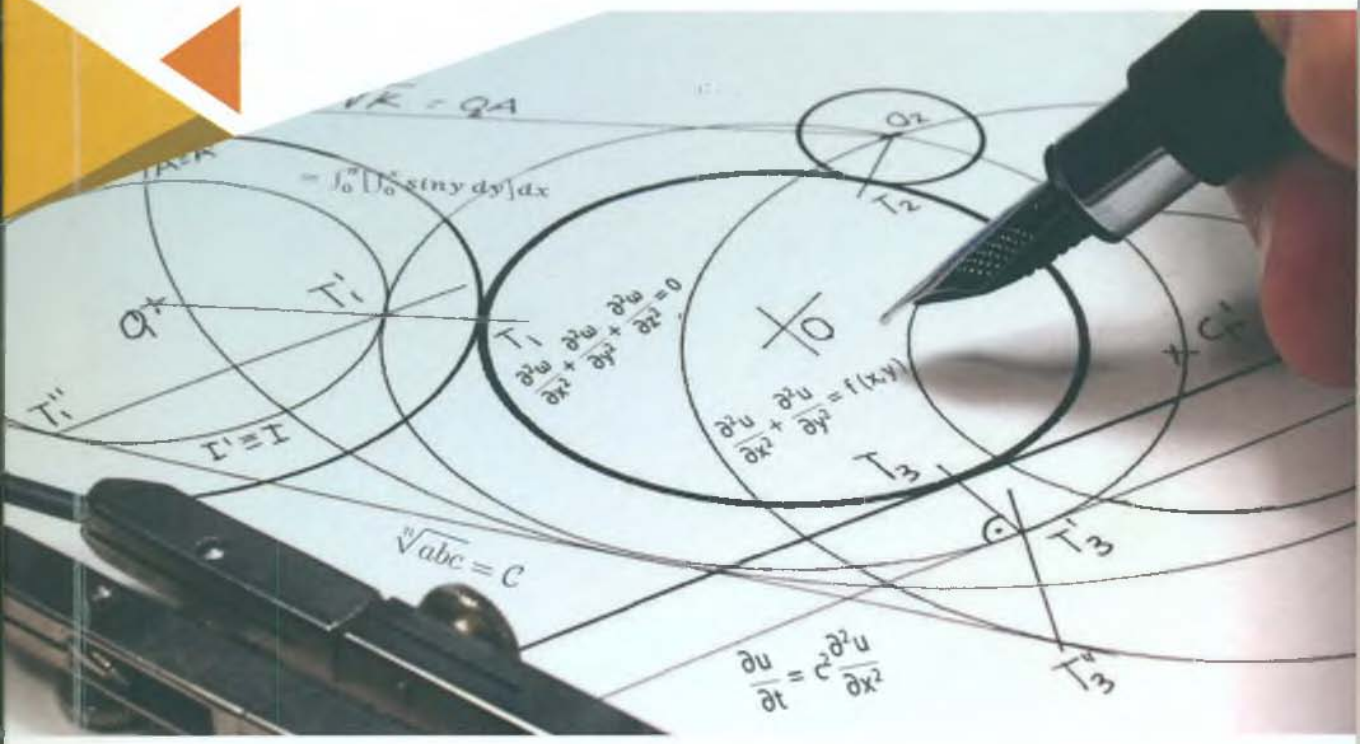

COLLEGE OF ARTS AND SCIENCES

Immersion Principle for a Two-Point Boundary Value Problem with Boundary Conditions

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In order to solve topical problems of natural sciences, technology, economy and ecology new mathematical methods allowing solving complex boundary value problems are needed. Mathematical models of management processes by nuclear and chemical reactors, control of electric power and robotic systems, economic management and others are complex boundary value problems of ordinary differential equations.

We consider a two-point boundary value problem with boundary conditions of the given convex closed sets. It is shown that the boundary value problems for a linear system of ordinary differential equations can be reduced to the corresponding initial value problems of optimal control. From the solution of the corresponding initial value problems of optimal control the solutions can be obtained: the boundary value problems with constraints, the boundary value problems with a parameter, construction of periodic solutions of autonomous systems. The basis of the proposed methods for solving boundary value problems with different constraints is a possibility of reducing these problems to a class of linear Fredholm integral equation of the first kind. Fredholm integral equation of the first kind belongs to the insufficiently explored problems in mathematics. Therefore, the fundamental research of integral equations and based on these solutions of boundary value problems of linear ordinary differential equations is a new promising direction in mathematics.

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