

CONSTRUCTION AND INVESTIGATION OF EXACT SOLUTIONS WITH FREE BOUNDARY TO A NONLINEAR HEAT EQUATION WITH SOURCE

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The article is devoted to the construction and investigation of exact solutions with free boundary to a second-order nonlinear parabolic equation. The solutions belong to the classes of generalized self-similar and generalized traveling waves. Their construction is reduced to Cauchy problems for second-order ordinary differential equations (ODE), for which we prove existence and uniqueness theorems for their solutions. A qualitative analysis of the ODE is carried out by passing to a dynamical system and constructing and studying its phase portrait. In addition, we present geometric illustrations.

Key words and phrases: nonlinear heat equation with source, thermal wave, exact solution, existence theorem, qualitative analysis of ordinary differential equations.

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