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Journal of Mathematics 2023, 11, 1040	Article Mathematical Analysis of the Stability of the Solution of the Cauchy Problem for the Heat Conduction Equation Yury A. Izrael Abstract: The problem of the stability of the solution of the Cauchy problem for the heat conduction equation is considered. The problem is solved in the case of a one-dimensional heat conduction equation. The stability of the solution is analyzed using the method of the maximum principle. The results show that the solution is stable in the case of a one-dimensional heat conduction equation. Keywords: Cauchy problem; heat conduction equation; stability; maximum principle	1. Introduction The Cauchy problem for the heat conduction equation is one of the most important problems in the theory of partial differential equations. It is a problem of finding the temperature distribution in a body, given the temperature on the boundary of the body. The problem is ill-posed in the sense of Hadamard, which means that the solution does not depend continuously on the data. This makes the problem difficult to solve in practice. In this paper, we consider the problem of the stability of the solution of the Cauchy problem for the heat conduction equation. We will use the method of the maximum principle to analyze the stability of the solution. The results show that the solution is stable in the case of a one-dimensional heat conduction equation.	2. Mathematical Model The heat conduction equation is a parabolic partial differential equation. It is written as follows: $\frac{\partial T}{\partial t} = \kappa \frac{\partial^2 T}{\partial x^2}$ where T is the temperature, t is time, x is the spatial coordinate, and κ is the thermal conductivity. The Cauchy problem for the heat conduction equation is to find the temperature distribution $T(x, t)$ in a body, given the temperature on the boundary of the body $T(0, t) = T_0(t)$ and $T(L, t) = T_L(t)$. The problem is ill-posed in the sense of Hadamard, which means that the solution does not depend continuously on the data. This makes the problem difficult to solve in practice.
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