OL'GA ALEKSANDROVNA LADYZHENSKAYA

I was guided by the desire to prove, as simply as possible, that, like systems of n linear algebraic equations in n unknowns, the solvability of basic boundary value (and initial boundary value) problems for partial differential equations is a consequence of the uniqueness theorems in are sufficiently large in a function space. - Ladyzhenskaya

Olíga Aleksandrovna Ladyzhenskaya was born during 1922 in Kostroma Province. During 1947, she received her undergraduate degree from Moscow State University. Ladyzhenskaya earned her Ph.D. at the Leningrad State University in 1949, followed by a Doctor of Sciences degree at the Moscow State University in 1953. The influence of her family and peers helped Ladyzhenskaya push leaps and bounds in the mathematical field both pure and applied. Her main interests are in partial differential equations. She has made extremely significant contributions to the theory of initial-boundary value problems and Navier-Stokes equations. She is now a Professor of Mathematics at the Physics Department of St. Petersburg University and the Head of the Laboratory of Mathematical Physics at the St. Petersburg Branch of the Steklov Mathematical Institute of the Academy of Sciences of Russia. The purpose of this worksheet is to provide some understanding of boundary conditions using the simple heat equation, Ut = a2Uxx , as an example.

Example: Suppose the rod is 1 cm in length. x=0 o--------------o x=1 and at x=0 the rod is cooled to and kept at zero degrees Celsius. At x=1 the rod is heated or cooled as necessary to maintain the temperature at 25 degrees Celsius. Then the boundary conditions of the equation are: U(0 , t) = O and U(1, t) = 25.

1) Suppose the rod is 3cm in length and at x=0 the rod is kept at 12 degrees Celsius and at x=3 the rod is kept at 0 degrees, what are the boundary conditions of the equation?

2) With the boundary conditions being U(0 , t) = 14 and U(7 , 13) describe as much of the rodís characteristics and temperature as possible.

References

1. Ladyzhenskaya, Olíga A.. The Boundary Value Problems of MAthematical Physics. (Applied Mathematical Sciences; v. 49). Translated by Jack Lohwater. Spring-Verlag New York Inc. 1985

2. http://www.awm-math.org/noetherbrochure/Ladyzhenskaya94.html

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