

# *Generalized Heat Transfer between Solids and Gases under Nonlinear Boundary Conditions*

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**Introduction.** Let  $B$  be a solid body with a given temperature  $\psi(x)$  surrounded by a gas with temperature 1. Then heat will transfer through the surface  $\dot{B}$  of  $B$  obeying the Newton Law of Cooling

$$\frac{\partial u}{\partial \nu} = g(u)$$

where  $u$  is the temperature of the body,  $\partial u/\partial \nu$  is the thermal gradient at the surface evaluated from the interior in the direction of the outward normal and  $g(u) = K(1 - u)$ . For moderate temperatures  $K$  is approximately constant; however, for very high or low temperatures  $K$  will change much and nonlinearly with the temperature  $u$  (for more details and references see [7]). We thus get the following boundary value problem:

$$\begin{aligned} \sum_{i=1}^n \frac{\partial^2 u}{\partial x_i^2} - \frac{\partial u}{\partial t} &= 0 \quad \text{for } x \in B, \quad t > 0, \\ (0) \quad u(x, 0) &= \psi(x) \quad \text{for } x \in \bar{B}, \\ \frac{\partial u}{\partial \nu} &= g(u) \quad \text{for } x \in \dot{B}, \quad t > 0, \end{aligned}$$

where  $g(u)$  is nonlinear in  $u$ .

In what follows we shall not make use of the special form of  $g$  but only make use of the following physically evident facts:  $g(u)$  is continuous and decreasing in  $u$  and  $g(1) = 0$ . Furthermore, instead of considering the system (0) we shall

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