

# On A Nonhomogeneous Burgers' Equation

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*Abstract:* In this paper Cauchy problem for the following nonhomogeneous Burgers' equation is considered (1)  $u_t + uu_x = \mu u_{xx} - kx$ ,  $x \in R, t > 0$ , where  $\mu, k > 0$ . Since the nonhomogeneous term  $kx$  is not belong to any  $L^p(R)$  space, this type equation is beyond usual Sobolev framework in some sense. Through Hopf-Cole transformation, (1) take the form (2)  $\varphi_t - \varphi_{xx} = -x^2\varphi$ . With help of Hermite polynomials and their usefull properties, (1) and (2) are solved exactly and then the large time behaviors of the solutions are considered, along with the similar line with [?] in which Burgers' equation is treated. Especially, we observe that the nonhomogeneous Burgers' equation (1) is not nonlinear stability.

*Key Words:* nonhomogeneous Burgers' equation, explicit solution, large time behavior, Hermite polynomials

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