ASYMPTOTIC BEHAVIOR FOR NUMERICAL SOLUTIONS OF A SEMILINEAR PARABOLIC EQUATION WITH A NONLINEAR BOUNDARY CONDITION[*]

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Abstract. This paper concerns the study of the numerical approximation for the following initial-boundary value problem,

$$u_t = u_{xx} - au^p, \quad 0 < x < 1, \quad t > 0,$$
$$u_x(0,t) = 0, \quad u_x(1,t) + bu^q(1,t) = 0, \quad t > 0,$$
$$u(x,0) = u_0(x) \geq 0, \quad 0 \leq x \leq 1,$$

where $a > 0$, $b > 0$ and $p > q > 1$. We show that the solution of a semidiscrete form of the initial value problem above goes to zero as t approaches infinity and give its asymptotic behavior. We provide some numerical experiments that illustrate our analysis.

Key words. semidiscretizations, semilinear parabolic equation, asymptotic behavior, convergence

AMS subject classifications. 35B40, 35B50, 35K60, 65M06

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