

Decay estimates and comparison results  
for nonlinear parabolic problems

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Sharp upper bounds for  $u(x, t)$ ,  $x \in \Omega$ ,  $t > 0$ , and for  $|\nabla u(x, t)|$ ,  $x \in \partial\Omega$ ,  $t > 0$  will be established, where  $u(x, t) \geq 0$  is the solution of the following nonlinear parabolic problem

$$\begin{cases} \Delta u - u_t = F, & x \in \Omega \subset \mathbb{R}^N, \quad t > 0, \\ u(x, t) = 0, & x \in \partial\Omega, \quad t > 0, \\ u(x, 0) = g(x) > 0, & x \in \Omega, \end{cases}$$

with  $F = -f(u)$ , or  $F = \text{const. } |\nabla u|^2$ .

Such upper bounds will also be established for the temperature in a long cylindrical region whose far end and lateral surface are held at zero temperature and a nonzero temperature is prescribed at the near end, with  $u(x, 0) = 0$ ,  $x \in \Omega$ .