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Asymptotic analysis of an ordinary differential equation and non-uniqueness for a semilinear partial differential equation. (English) [Zbl 0614.35043](#)

Arch. Ration. Mech. Anal. 91, 231-245 (1986).

Die Untersuchung der semilinearen Wärmeleitungsgleichung

$$\partial_t \psi(t, x) = \Delta \psi(t, x) + |\psi(t, x)|^{\gamma-1} \psi(t, x)$$

für $(t, x) \in (0, \infty) \times \mathbb{R}^n$, $\gamma > 1$, auf Lösungen $\psi(t, x) = t^{-1/(\gamma-1)} u(|x|/\sqrt{t})$, $u: [0, \infty) \rightarrow \mathbb{R}$, $u \in C^2$, führt auf die gewöhnliche Differentialgleichung

$$u''(x) + ((n-1)/x + x/2)u'(x) + (k/2)u(x) + |u(x)|^{\gamma-1}u(x) = 0 \quad (*)$$

mit $u'(0) = 0$, $k = 2/(\gamma - 1)$ und $x > 0$.

Verf. setzt in der vorliegenden Arbeit die Untersuchungen der Gleichung (*) aus A. Haraux und Verf. [Indiana Univ. Math. J. 31, 167–189 (1982; [Zbl 0465.35049](#))] auf Lösungsverhalten für $x \rightarrow \infty$, Nullstellen der Lösungen und verschiedene Anfangsbedingungen bei $x = 0$ fort.

Reviewer: [L. Jantscher](#)

MSC:

- [35K55](#) Nonlinear parabolic equations
- [35K58](#) Semilinear parabolic equations
- [35B40](#) Asymptotic behavior of solutions to PDEs
- [35C06](#) Self-similar solutions to PDEs
- [35A30](#) Geometric theory, characteristics, transformations in context of PDEs

Cited in **22** Documents

Keywords:

[self-similar radially symmetric solutions](#); [semilinear heat equation](#)

Full Text: [DOI](#)

References:

- [1] P. Baras, Non-unicité des solutions d'une équation d'évolution non-linéaire, to appear.
- [2] H. Brezis & A. Friedman, Nonlinear parabolic equations involving measures as initial conditions, MRC Technical Summary Report # 2277, 1981.
- [3] H. Fujita, On the blowing up of solutions of the Cauchy problem for $u_t = \Delta u + u^p$, J. Fac. Sci. Univ. Tokyo, Sect. I 13 (1966), 109-124. · [Zbl 0163.34002](#)
- [4] A. Haraux & F. B. Weissler, Non-uniqueness for a semilinear initial value problem, Ind. Univ. Math. J. 31 (1982), 167-189. · [Zbl 0506.35055](#) · [doi:10.1512/iumj.1982.31.31016](#)
- [5] K. McLeod & J. Serrin, Uniqueness of solutions of semilinear Poisson equations, Proc. Natl. Acad. Sci. 78 (1981), 6592-6595. · [Zbl 0474.35047](#) · [doi:10.1073/pnas.78.11.6592](#)
- [6] W.-M. Ni, Uniqueness, non-uniqueness, and related questions of nonlinear elliptic and parabolic equations, preprint.
- [7] L. A. Peletier, D. Terman, & F. B. Weissler, On the equation $u + 1/2 \Delta u + f(u) = 0$, to appear. · [Zbl 0615.35034](#)
- [8] F. B. Weissler, Local existence and non-existence for semilinear parabolic equations in L^p , Ind. Univ. Math. J. 29 (1980), 79-102. · [Zbl 0443.35034](#) · [doi:10.1512/iumj.1980.29.29007](#)
- [9] F. B. Weissler, Existence and non-existence of global solutions for a semilinear heat equation, Is. J. Math. 38 (1981), 29-40. · [Zbl 0476.35043](#) · [doi:10.1007/BF02761845](#)
- [10] F. B. Weissler, L^p -energy and blow-up for a semilinear heat equation, Proc. AMS symp. in nonlinear func. anal., July 1983, to appear.
- [11] F. B. Weissler, Rapidly decaying solutions of an ordinary differential equation, with applications to semilinear elliptic and

parabolic partial differential equations, following in this issue. · [Zbl 0604.34034](#)

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