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**Partial regularity of the zero-set of solutions of linear and superlinear elliptic equations.**

(English) [Zbl 0593.35047](#)

*J. Differ. Equations* 60, 420-433 (1985).

Let  $u$  be a solution of  $\Delta u = f(x, u, \nabla u)$  in  $\Omega$ , where  $\Omega$  is an open region in  $R^m$ . It is shown that the Hausdorff dimension of the singular subset

$$S = \{x \in \Omega : u(x) = 0 \text{ and } \nabla u(x) = 0\}$$

of the zero-set  $\{u = 0\}$  is at most  $m-2$ . The superlinear case  $|f(x, u, \nabla u)| \leq A|u|^\alpha + B|\nabla u|^\beta$ ,  $\alpha \geq 1$ ,  $\beta \geq 1$  and the linear case are discussed separately. The main application concerns the study of the free boundary in free boundary problems.

Reviewer: [D.Tiba](#)

**MSC:**

[35J65](#) Nonlinear boundary value problems for linear elliptic equations

[35B65](#) Smoothness and regularity of solutions to PDEs

[35R35](#) Free boundary problems for PDEs

Cited in **1** Review  
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**Keywords:**

[nonlinear elliptic problems](#); [Hausdorff dimension](#); [free boundary problems](#)

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**References:**

- [1] Aronszajn, N, A unique continuation for solutions of elliptic partial differential equations or inequalities of second order, *J. math. pures appl.*, 36, 235-249, (1957) · [Zbl 0084.30402](#)
- [2] Caffarelli, L.A; Friedman, A, The free boundary in the Thomas-Fermi atomic model, *J. differential equations*, 32, 335-356, (1979) · [Zbl 0408.35083](#)
- [3] Caffarelli, L.A; Friedman, A, The shape of axisymmetric rotating fluids, *J. funct. anal.*, 35, 109-142, (1980) · [Zbl 0439.35068](#)
- [4] Cordes, H.O, Über die bestimmtheit der Lösungen elliptischer differentialgleichungen durch anfangsvorgaben, *Nachr. akad. wiss. Göttingen iia math. phys. kl.*, 239-258, (1956) · [Zbl 0074.08002](#)
- [5] [DiBenedetto and A. Friedman](#), Conduction-convection problems with change of phase, [J. Differential Equations](#), to appear. · [Zbl 0593.35085](#)
- [6] Erdélyi, A, ()
- [7] Friedman, A, *Variational principles and free boundary problems*, (1982), Wiley New York · [Zbl 0564.49002](#)

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