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By Juha Heinonen, Tero Kilpeläinen, Olli Martio, Mathematics

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A self-contained treatment appropriate for advanced undergraduates and graduate students, this text offers a detailed development of the necessary background for its survey of the nonlinear potential theory of superharmonic functions.

Starting with the theory of weighted Sobolev spaces, this treatment advances to the theory of weighted variational capacity. Succeeding chapters investigate solutions and supersolutions of equations, with emphasis on refined Sobolev spaces, variational integrals, and harmonic functions. Chapter 7 defines superharmonic functions via the comparison principle, and chapters 8 through 14 form the core of the nonlinear potential theory of superharmonic functions. Topics include balayage; Perron's method, barriers, and resolutivity; polar sets; harmonic measure; fine topology; harmonic morphisms; and quasiregular mappings. The text concludes with explorations of axiomatic nonlinear potential theory and helpful appendixes.

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