Heinonen, Juha
Quasiconformal mappings onto John domains. (English) [Zbl 0712.30017]

Suppose that \( f \) is a quasiconformal map of the unit ball \( \mathbb{B}^n \) onto a domain \( D \) in \( \mathbb{R}^n \). Then the first main theorem of this paper provides nine equivalent conditions for \( D \) to be a John domain. The conditions involve either the geometry of \( D \) or the behavior of \( f \). Similar results in the plane for conformal maps were obtained by Ch. Pommerenke [J. Lond. Math. Soc. 26, 77-88 (1982; Zbl 0464.30012)]; see also R. Näkki and J. Väisälä [Exp. Math. 9, 3-43 (1991)]. The second main theorem extends a subinvariance result of J. Väisälä [Acta Math. 162, No.3, 201-225 (1989; Zbl 0674.30017)], and it describes how a quasiconformal mapping behaves in nice subdomains. This quite general theorem contains as a special case e.g. the fact that if \( f \) is a quasiconformal map of a domain \( D \) onto the unit ball \( \mathbb{B}^n \), then the image of every ball \( B \subset D \) is a uniform domain in \( \mathbb{B}^n \); this result was effectively used for plane conformal maps \( f \) in establishing the \((1 + \epsilon)\)-integrability of \( f' \) on lines [J. L. Fernández, J. Heinonen and O. Martio, J. Anal. Math. 52, 117-132 (1989; Zbl 0677.30012)].

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