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Spherically symmetric space-times. Black holes

3.1 Spherically symmetric gravitational fields3.1.1 A regular centre and asymptotic flatness; 3.2 The Reissner-Nordstrom-(anti-)de Sitter solution; 3.2.1 Solution of the Einstein equations; 3.2.2 Special cases; The (anti-)de Sitter metric; The Schwarzschild metric and the Newton law; The Reissner-Nordstrom metric; Metrics with a nonzero cosmological constant; 3.3 Horizons and geodesics in static, spherically symmetric space-times; 3.3.1 The general form of geodesic equations; 3.3.2 Horizons, geodesics and the quasiglobal coordinate; 3.3.3 Transitions to Lematre reference frames

3.3.4 Horizons, R- and T-regions3.4 Schwarzschild black holes. Geodesics and a global description; 3.4.1 R- and T-regions; 3.4.2 Geodesics in the R-region; 3.4.3 Particle capture by a black hole; 3.4.4 A global description: The Kruskal metric; 3.4.5 From Kruskal to Carter-Penrose diagram for the Schwarzschild metric; 3.5 The global causal structure of space-times with horizons; 3.5.1 Crossing the horizon in the general case; 3.5.2 Construction of Carter-Penrose diagrams; 3.6 A black hole as a result of gravitational collapse; 3.6.1 Internal and external regions. Birkhoff's theorem

3.6.2 Gravitational collapse of a spherical dust cloudChapter 4. Black holes under more general conditions; 4.1 Black holes andmassless scalar fields; 4.1.1 The general STT and the Wagoner transformations; On phantom fields; 4.1.2 Minimally coupled scalar fields; 4.1.3 Conformally coupled scalar field; Solutions with nonconformal coupling; 4.1.4 Anomalous (phantom) fields. The anti-Fisher solution; 4.1.5 Cold black holes in the anti-Fisher solution; 4.1.6 Vacuum and electrovacuum in Brans-Dicke theory; 4.1.7 Summary for massless scalar fields

4.2 Scalar fields with arbitrary potentials. No-go theorems

Sommario/riassunto

Assuming foundational knowledge of special and general relativity, this book guides the reader on issues surrounding black holes, wormholes, cosmology, and extra dimensions. Its first part is devoted to local strong field configurations (black holes and wormholes) in general relativity and the most relevant of alternative theories: scalar-tensor, f (R) and multidimensional theories. The second part is on cosmology, including inflation and a unified description of the whole evolution of the universe. The third part concerns multidimensional theories of gravity and contains a number of original r