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Turning Point Instabilities for Relativistic Stars and Black Holes
JOSHUA SCHIFFRIN, ROBERT WALD, The University of Chicago — In the light of recent results relating dynamic and thermodynamic stability of relativistic stars and black holes, we re-examine the relationship between "turning points"—i.e., extrema of thermodynamic variables along a one-parameter family of solutions—and instabilities. We give a proof of Sorkin's general result—showing the existence of a thermodynamic instability on one side of a turning point—that does not rely on heuristic arguments involving infinite dimensional manifold structure. We use the turning point results to prove the existence of a dynamic instability of black rings in 5 spacetime dimensions in the region where $c_J > 0$, in agreement with a result of Figueras, Murata, and Reall.

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