1056-53-593   **Jonathan E Holland*** (`jeh89@pitt.edu`), Department of Mathematics, University of Pittsburgh, 301 Thackeray Hall, Pittsburgh, PA 15260. *Third order odes and conformal Finsler geometries.*

We discuss contact invariant structures on the space of solutions of a third order ordinary differential equation. When the Wünschmann invariant vanishes, it is a result Chern that the space of solutions admits a conformal Lorentzian structure. In the general case, we define the notion of a causal structure, and show that the space of solutions supports one. The Wünschmann invariant is then related to the projective curvature of the curve cut out by the causal structure in the projective tangent space. When the Wünschmann vanishes, the causal structure is then precisely the sheaf of null geodesics of the Chern conformal structure. We then introduce a Lagrangian and associated Hamiltonian from which the degenerate conformal Lorentzian metric and and the ultrahyperbolic metric of Nurowski are given on certain natural associated bundles. Finally, the results of Frittelli, Kozameh, and Newman on complete solutions of the eikonal equation are generalized. (Received September 14, 2009)