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Section:

9. Ordinary Differential Equations and Dynamical Systems

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About the structure of some typical singularities in implicit ordinary differential equations

The system of *implicit ordinary differential equations* in form $A(x, t\dot{x}(t) = b(x,t)$ is studied by asymptotic methods in a domain close to the singular surface placed in a space of the vector x and parameter t, where the main determinant of matrix $A(x,t)$ is vanished. The uniqueness theorem and existence theorem are fail for the singular solution $x(t)$, if it intersect the singular surface. A limited number of the singular solutions through the singular point x_0, t_0 passed was obtained for some conditions additional to the condition $detA(x_0, t_0) = 0$. The various types of the singularities corresponds to these cases. They had been called the "turn", the "intersection", the "reflecting" and so on, and they appear in some physical applications.

Reference: S. O. Alexeyev, and M. V. Pomazanov, Gauss-Bonnet Black Holes in Low Energy String Theory, *Gravitation & Cosmology* **3** 1 (1997), 191-194