

Some Hyperbolic Problems For the Second Order Quasi-linear Equations of Mixed Type

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Abstract.

Some specific quasi-linear second order equations are considered. These equations are of hyperbolic type but they also admit a parabolic degeneration. After constructing of first integrals it becomes possible to obtain the general solution (in implicit form) for each of the given equations. Using these general solutions, the non-linear Cauchy problems with open support of data are solved. In each case, the solving process of the non-linear Cauchy problem requires to obtain a solution and to define the domain of its propagation simultaneously. Hence, the structures of such domains are also studied in this work.

Also two cases of Goursat characteristic problems are considered. In the case of the first Characteristic problem the sufficient conditions for existence of the solution are established. Also, another characteristic problem with partially free characteristic support is investigated. It is shown, that, in some cases, the second problem with partially free characteristic support can be reduced to the first Characteristic problem.

The presentation is mainly based on the results from the following papers:

- [1] G. Baghaturia: Nonlinear Versions of Hyperbolic Problems for One Quasi-Linear Equation of Mixed Type, *Journal of Mathematical Sciences*, 208(2015), 621-634.
- [2] M. Menteshashvili: The Nonlinear Cauchy Problem with Solutions Defined in Domains with Gaps, *Journal of Mathematical Sciences*, 206(2015), 413-423.