

Darboux transformations for a twisted derivation and quasideterminant solutions to the super KdV equation

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(Submitted on 8 Nov 2009)

This paper is concerned with a generalized type of Darboux transformations defined in terms of a twisted derivation D satisfying $D(AB) = D(A) + \sigma(A)B$ where σ is a homomorphism. Such twisted derivations include regular derivations, difference and q -difference operators and superderivatives as special cases.

Remarkably, the formulae for the iteration of Darboux transformations are identical with those in the standard case of a regular derivation and are expressed in terms of quasideterminants. As an example, we revisit the Darboux transformations for the Manin-Radul super KdV equation, studied in Q.P. Liu and M. Mañanas, *Physics Letters B* **396**:133--140, (1997). The new approach we take enables us to derive a unified expression for solution formulae in terms of quasideterminants, covering all cases at once, rather than using several subcases. Then, by using a known relationship between quasideterminants and superdeterminants, we obtain expressions for these solutions as ratios of superdeterminants. This coincides with the results of Liu and Mañanas in all the cases they considered but also deals with the one subcase in which they did not obtain such an expression. Finally, we obtain another type of quasideterminant solutions to the Main-Radul super KdV equation constructed from its binary Darboux transformations. These can also be expressed as ratios of superdeterminants and are a substantial generalization of the solutions constructed using binary Darboux transformations in earlier work on this topic.

Subjects: **Exactly Solvable and Integrable Systems (nlin.SI)**

Cite as: [arXiv:0911.1413v1](https://arxiv.org/abs/0911.1413v1) [nlin.SI]

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[v1] Sun, 8 Nov 2009 02:25:13 GMT (19kb)

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