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All regular 4×4 solutions of the Yang-Baxter equation

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In recent years an indirect approach for classifying solutions to the Yang-Baxter equation has emerged, based on the Sutherland equations and the so-called boost operator. We describe this method, and show how it can be used to classify all regular solutions of size 4×4 . Beyond the usual 6- and 8-vertex type solutions, we find several new R-matrices of non-difference form. All of these new R-matrices give rise to transfer matrices with a non-trivial Jordan block spectrum. One of them corresponds to a novel non-diagonalisable deformation of the XXX spin chain.

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