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Q-operators for the open Heisenberg spin chain

We construct Q-operators for the open spin-1/2 XXX Heisenberg spin chain with diagonal boundary matrices. The Q-operators are defined as traces over an infinite-dimensional auxiliary space involving novel types of reflection operators derived from the boundary Yang-Baxter equation. We argue that the Q-operators defined in this way are polynomials in the spectral parameter and show that they commute with transfer matrix. Finally, we prove that the Q-operators satisfy Baxter's TQ-equation and derive the explicit form of their eigenvalues in terms of the Bethe roots.