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Computational Phase Diagrams for Strongly Correlated Quantum Spins[1] ROGER HAYDOCK, C.M.M. NEX, University of Oregon — In an extended system of strongly interacting quantum spins, a single spin flip is an example of a microscopic disturbance whose time-evolution is well behaved and given by Heisenberg's equation. At long times most of the disturbance decays exponentially, leaving behind a few excitations whose decay is slower than exponential. These have energies at which the excitation spectrum is singular, separating bands of qualitatively different excitations. We apply the recursion method [Solid State Physics 35, Academic Press, 2l5-94(1980)] to a generalization of Heisenberg's equation for the evolution of an appropriate microscopic disturbance. This produces a continued fraction whose essential singularities are the desired phase boundaries. Calculations for some Heisenberg spin Hamiltonians illustrate this approach.

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