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Diagrammatic analysis of the Hubbard model: Stationary property of the thermodynamic potential

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Abstract

Diagrammatic approach proposed many years ago for strong correlated Hubbard model is developed for analyzing of the thermodynamic potential properties. The new exact relation between such renormalized quantities as thermodynamic potential, one-particle propagator and correlation function is established. This relation contains additional integration of the one-particle propagator by the auxiliary constant. The vacuum skeleton diagrams constructed from irreducible Green's functions and tunneling propagator lines are determined and special functional is introduced. The properties of such functional are investigated and its relation to the thermodynamic potential is established. The stationary properties of this functional with respect to first order changing of the correlation function is demonstrated and as a consequence the stationary properties of the thermodynamic potential is proved.