

Large- N_f behavior of the Yukawa model: analytic results.

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Abstract: We investigate the Yukawa model in which N_f fermions are coupled with a scalar field ϕ through a Yukawa interaction.

The phase diagram is rather well understood. If the fermions are massless, there is a chiral transition at T_c : for $T < T_c$ chiral symmetry is spontaneously broken. At $N_f = \infty$ the transition is mean-field like, while, for any finite N_f , standard arguments predict Ising behavior. This apparent contradiction has been solved by Kogut et al., that showed by scaling arguments and Monte Carlo simulations that in the large- N_f limit the width of the Ising critical region scales as a power of $1/N$, so that only mean-field behavior is observed for N_f strictly equal to infinity.

In this talk, we will show how the results of Kogut et al. can be recovered analytically in the framework of a generalized $1/N_f$ expansion. The method we use is a simple generalization of the technique discussed in Caracciolo et al., Nucl. Phys. B **707** (2005), and applied there to a generalized Heisenberg model.