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L. Chayes* (lchayes@math.ucla.edu), Department of Mathematics, University of California, Los Angeles, CA 90095-1555. *Mean-Field Approach to the Problem of Phase Transitions in Physically Realistic Systems.*

Mean-field theory is a physically appealing approach to the subject of phase transitions for systems with many degrees of freedom. The topic will first be explored at the level of heuristics and then the theory itself placed on a solid mathematical foundation for the classical case. It will then be demonstrated that under certain circumstances (e.g. large spatial dimension) mean-field theory is an asymptotic approximation to physically realistic models. In particular, in the asymptotic regime, it will be established that for discontinuous transitions - phase transitions of the first type - mean-field theory will correctly predict the nature of the transition. Future directions, specifically the mean-field approach to quantum phase transitions, will be briefly discussed. The talk will be delivered at an introductory level requiring no prerequisite from the physical sciences. (Received March 03, 2006)