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Numerical study of the dimensionally reduced 3D Ising model

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We study the 3D Ising model in the infinite volume limit $N_{x,y,z} \rightarrow \infty$ by means of numerical simulations. We determine T_c as well as the critical exponents α, β, γ and ν , based on finite-size scaling and histogram reweighting techniques. In addition, we study a “dimensionally reduced” scenario where N_z is kept fixed (e.g. at 2, 4, 8), while the limit $N_{x,y} \rightarrow \infty$ is taken. For each fixed N_z we determine T_c as well as $\alpha, \beta, \gamma, \nu$. For T_c we find a smooth transition curve which connects the well known critical temperatures of the 2D and the 3D Ising model. Regarding $\alpha, \beta, \gamma, \nu$ our data suggest that the “dimensionally reduced” Ising model is in the same universality class as the 2D Ising model, regardless of N_z .

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