Combinatorial Problems Raised by Statistical Mechanics
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Mayer's graph weights for the hard-core continuum gas in one dimension

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Abstract

Short review of Mayers theory of cluster integrals. First and second Mayers weights W(g) and w(c) for graphs. Combinatorial functional equations for weighted connected graphs. Analysis of hard-core continuum gas in one dimension: global formulas, Lambert function, virial expansion and underlying combinatorics; methods for the computation of the second Mayer weight w(c) for individual connected graphs using Ehrhart polynomials or graphs homomorphisms; explicit and asymptotic evaluation of w(c) for infinite families of connected graphs (complete graphs, cycles, complete graphs minus an edge); table of w(c) for all 2-connected graphs c of size at most 6; open problems.