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Riesz Gases and their Phase Diagrams in Dimension One

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$Riesz\ gases$ form an important class of point processes in statistical physics, consisting in an infinite number of particles interacting through an inverse power-law repulsive pair potential of homogeneity s. These objects appear in many unexpected mathematical situations and seem to be sort of universal. An interesting although very challenging question both theoretically and numerically is that of the existence of phase transitions with respect to the temperature and the homogeneity parameter s. In this talk, I will present what is (un)known at the current time on these models focusing mainly on the case of the dimension one. I will then present numerical evidences which support the existence of a phase transition in dimension one when the parameter s ranges between two remarkable models, namely the one-dimensional $Coulomb\ gas$ and the $Dyson\ log\text{-}gas$, and discuss the nature of this transition. Many questions will be left open, only hopefully to spur new contributions in the future.

Orateur: LELOTTE, Rodrigue (CERMICS, ENPC)