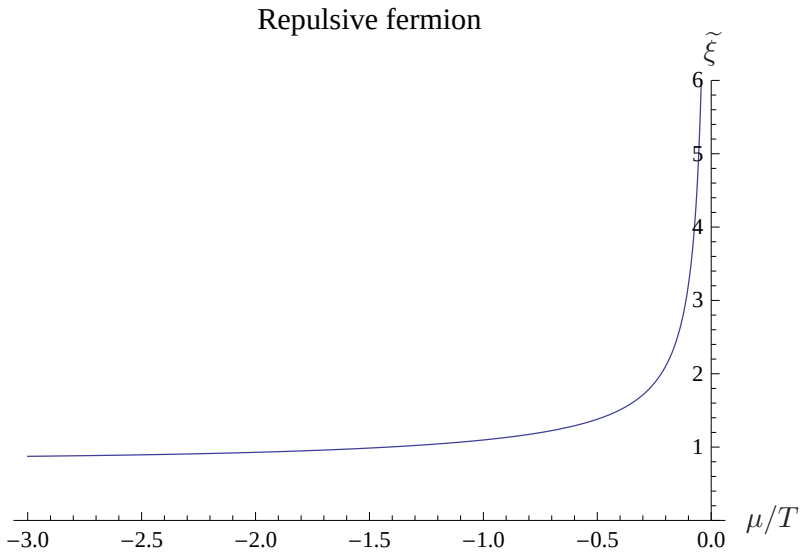

FIG. 21: The energy per particle scaling function $\widetilde{\xi}$ for repulsive fermions as a function of μ/T.

methods are of course not exact, they are sufficiently novel to provide new insights into these systems. It would be worthwhile to undertand the corrections to our results due to other types of diagrams involving N-body scattering for $N > 2$, and also other more complicated diagrams involving 2-body scattering; this can be systematically explored using the full formalism in [20].

In this paper we have mainly analyzed the 2-dimensional case, deferring the analysis of the integral equations in the 3-dimensional case to a separate publication[23]. For the 2-dimensional case, this required us to define a meaningful unitary limit where the S-matrix equals -1, and such a limit has not been considered before. We have calculated most of the interesting scaling functions for the free energy and energy per particle.

The ratio of the shear viscosity to entropy density η/s was also analyzed, and for fermions and repulsive bosons, it is above the conjectured lower bound of $\hbar/4\pi k_B$.