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Integrable Cousin of a One-Dimensional Gravitating System KENNETH YAWN, BRUCE MILLER, Texas Christian University — The first gravitational simulations employed a one-dimensional system consisting of N parallel mass sheets. In common with the famous Fermi-Pasta-Ulam problem, this system resists coming to equilibrium. Consequently it became of seminal interest in the new field of nonlinear dynamics. Exchange symmetry in acceleration partitions the configuration space of an N particle one-dimensional gravitational system (OGS) into N! equivalent cells. We take advantage of the consequent small angular separation of the acceleration in neighboring cells to construct a related, integrable, version of the system which takes the form of a central force problem in N-1 dimensions. The properties of the latter, including the construction of trajectories and possible continuum limits, are explored. Dynamical simulation is employed to compare the two models. For some initial conditions, excellent agreement is observed, yielding insight into the source of instability in the original system.

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