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Numerical Exploration of an Integrable Analog to a One-Dimensional Gravitating System KENNETH YAWN, BRUCE MILLER, Texas Christian University — The first gravitational simulations employed a one dimensional gravitational sheet system (OGS) consisting of N parallel mass sheets that interact purely through the gravitational force. Numerous studies have shown this system to have characteristics in common with the famous Fermi-Pasta-Ulam problem in that it resists relaxation to equilibrium. As a result, it is of special interest in the study of non-linear dynamics and of the thermodynamics of systems with long range interactions. Exchange symmetry in acceleration partitions the configuration space of an N particle OGS into N! equivalent cells. As a consequence of the small angular separation of the acceleration in neighboring cells, an exactly integrable system (EIS) can be constructed that takes the form of a central force problem in N-1 dimensions. Numerical experiments have been performed on this integrable system analogous to the OGS. These experiments are employed to compare the time evolution of the EIS and the OGS. Under some special circumstances we find excellent agreement with theory.

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