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Nonlinear Dynamics and Thermodynamics of a One-Dimensional Plasma in Simulation PANKAJ KUMAR, BRUCE MILLER, Texas Christian Univ — We report on the results of a simulation study of the nonlinear dynamics and the thermodynamics of a single-component one-dimensional plasma with periodic boundary conditions. For a system of the plasma with three particles, we plot the Poincare maps and calculate the largest Lyapunov exponents. The results indicate that the three-particle system exhibits interesting dynamics with the phase-space containing periodic, quasiperiodic, as well as chaotic regions for different initial conditions. Special periodic orbits have been identified and their stabilities have been examined for the three-particle system. The behavior of the system in the thermodynamic limit has been simulated using large versions of the system and the dependences of the pressure, the coupling strength and the largest Lyapunov exponent on the average per-particle kinetic energy are presented. The results of the thermodynamic-limit simulations indicate that the net pressure is equal to the kinetic pressure for all temperatures and there is no phase transition.

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