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Dynamical Stability of a One-dimensional Plasma MATTHEW ROBERTS, Paschal High School, BRUCE MILLER, Texas Christian University — Since the days of the early computers, computer simulations have been incredibly important to the study of the motion of systems of particles as a way to model such systems as stars in a galaxy or charges in plasmas, which cannot be physically produced in a laboratory. These models are still used today, to the great benefit of the scientific community. In this study, the interaction of a one-dimensional system of charges with periodic boundary conditions is modeled with a computer simulation using an Euler integration technique. The chaos in a particular system is then studied through the computation of the largest Lyapunov exponent for that system. It is revealed that the value for this largest exponent, while independent of the initial conditions for a particular system, is dependent upon the size of the system, i.e. the number of particles in the system, as well as the charge-to-mass ratio of these particles. We will present the results of different computer simulations to demonstrate these dependencies by graphing intermediate averages for the greatest Lyapunov exponents over time for a set of systems of either different sizes, or with different charge-to-mass ratios.

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