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Density Waves in Systems of Non-Interacting Particles[1] E.J. KOLMES, V.I. GEYKO, N.J. FISCH, Princeton University — Under certain conditions, systems of non-interacting particles can give rise to density waves. In general, these waves do not require any particular perturbations in the initial density or velocity distributions, but they do tend to be strongly dependent on the boundary conditions of the system; one of the simplest examples is a collection of non-interacting particles bouncing in a constant gravitational field. A wide variety of different potentials can produce density waves, which change in both shape and behavior as the potential changes. We examine the structure and origin of these waves numerically and analytically. We also analyze the sensitivity of these waves to changes in different parameters of the system, including the effects of interparticle interactions on these structures. Strong interparticle interactions tend to disrupt the structure that develops in the non-interacting-particle case. We discuss possible experimental consequences of these phenomena.

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