Transition to Chaos in an Unforced, Undamped Double Pendulum using Numerical Simulations NOAH LENZ, CAVENDISH MCKAY, Marietta College — We study the transition to chaos in an unforced, undamped double pendulum using numerical simulations. Two properties, the Lyapunov exponent and the dimension of the invariant manifold, are used to determine the presence of chaotic behavior for a given set of initial conditions. Since the system is Hamiltonian, care must be taken in computing and interpreting the Lyapunov exponent. We find that the path from linear behavior to chaotic behavior depends on the initial distribution of energy in the system, and that for certain initial conditions spontaneous symmetry breaking and islands of nonchaotic behavior appear.

Cavendish McKay
Marietta College

Date submitted: 02 Mar 2018