Meeting: 1003, Atlanta, Georgia, MAA CP J1, MAA Session on Projects and Demonstrations that Enhance a Differential Equations Course

1003-J1-703 **Robert J Decker*** (rdecker@hartford.edu), University of Hartford, Mathematics Department, 200 Bloomfield Ave, West Hartford, CT 06117. *Surprising Properties of the Pendulum Equation using Mathlets.*

A mathlet created by the author will be used to demonstrate some interesting properties of the differential equation that governs the motion of a damped, rigid pendulum $y'' + by' + cy = a \sin \omega t$. In one demonstration we continuously vary the forcing frequency (ω) of a driven, undamped pendulum ($b = 0$), and observe the result in three views at once (phase plot and time plots). Here, by looking at a single solution curve one can observe the emergence of beats, as in a mass spring system. Instead of a transition to resonance, as in the case of a mass-spring system, however, one observes a transition to chaos.

In another activity, we vary the amount of damping (b) for an undriven pendulum ($a = 0$), and identify bifurcation values. As one increases the damping even more, something very interesting happens; the graph of a sine function emerges clearly from the tangle of solution curves. Finally, I will also discuss how such mathlets can be created using tools that I have developed (without using java). (Received September 28, 2004)