# Statement of Purpose: Assignment

This exercise aims to study the double pendulum: a classic dynamical system described by a system of nonlinear differential equations. With the system of four differential equations that describe the motion of the pendulum, a solution can be generated using the fourth order Runge-Kutta method. The energy function of the pendulum can be graphed over a time domain of 0-100 seconds; an animation will also be made of the motion of the pendulum.

# Statement of Purpose: Research

The main question I would like to investigate is the difference between numerical solution methods. There are many other methods beyond the 4th order Runge-Kutta method as used in the textbook example: Euler’s method, leapfrog method, the Verlet method, the modified midpoint method, and the Bulirsch-Stoer method. While Runge-Kutta is the most widely used, these other methods are advantageous for specific problems. Time permitting, effects such as damping and driving the pendulums, as well as varying their masses and rod lengths will be investigated to see how the motion is impacted by these factors. This problem can also be extended into three dimensions. Primarily, the variations between numerical solutions will be studied, comparing factors such as number of steps and computational complexity necessary to generate a realistic solution.