Classical Mechanics - Instructor's Master Document

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Basics and Week 1

Following Professor Scott Pratt's lecture notes we thought week 1 work would be good for an introduction of how to working with vectors and matrices in Python.https://web.pa.msu.edu/people/pratts/phy321/lectures/lectures.pdf Additionally, we thought it would be a good idea to show basic computational work through the classic cannonball problem seen in introductory physics 1 courses. By having heavily outlined instructions in the Jupyter Notebook that show the students how to write algorithms in Python and then implement them into a function, this should be a fairly easy week for those without any experience.

It should be noted that this Week 1 notebook should also be given to students along with the general "Python Basics" notebook provided, as that notebook gives a better introduction for programming syntax, packages, and techniques. "CM Week1," on the other hand, provides a better introduction for computational work and the implementation of physics concepts into programming.

Lagrangians

This workbook highlights the simple pendulum using Lagrangian mechanics. It is presumed that this notebook would be worked through near the tail end of the semester, so knowledge about basic Python syntax and documentation is presumed. This assignment is split into essentially two parts: the first part deals with using sympy to analytically find the differential equation describing a pendulum's motion using the Euler-Lagrange equation, and the second part involves numerically solving the equation of motion using the Euler-Cromer method of integration.