Seventh problem set for Physics 5300 - Theoretical Mechanics

Prof. Dick Furnstahl

Due date: Wednesday, February 27, 2019 in class

Important dates: Midterm 2 on Mar 7; No class Mar 11-15: Final date TBD

The problems on this set add up to 60 points. In order to receive full credit you have to obtain 48 points.

Chapter 8

- 8.9** [12 points] On paper. Basic application of Lagrangian methods for center-of-mass and relative motion.
- 8.14*** [12 points] Do the “sketches” in parts a) and c) as plots in a Jupyter notebook and print them out as part of your solution.
- 8.17** [12 points] Do parts a), b), and c) on paper and then verify the result *numerically* in a Jupyter notebook.
- 8.25*** [12 points] Find and plot the orbit in a Jupyter notebook.

Solving differential equations

- [12 points] Leapfrog method for orbits. Download the Orbital_eqs_with_different_algorithms.ipynb notebook, which solves orbits using the RK23 (with solve_ivp), Euler, and leapfrog algorithms. Follow the boldface instructions at the top of the notebook. You will hand in at least one figure with some comments about energy conservation and the orders of the different methods.