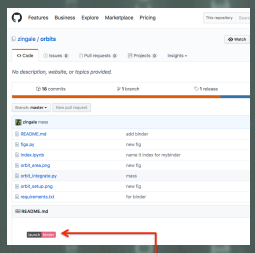
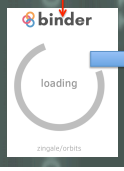
A lab on Kepler's laws that introduces students to coding

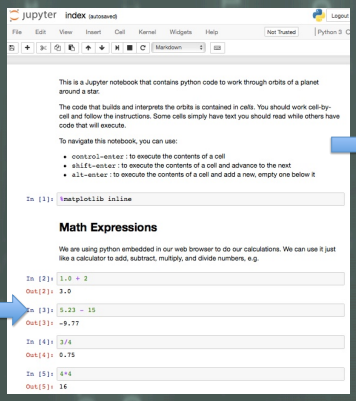
Glenda Denicolo[1] and Michael Zingale[2]
[1]Suffolk County Community College, NY
[2]Stony Brook University, NY
denicog@sunysuffolk.edu

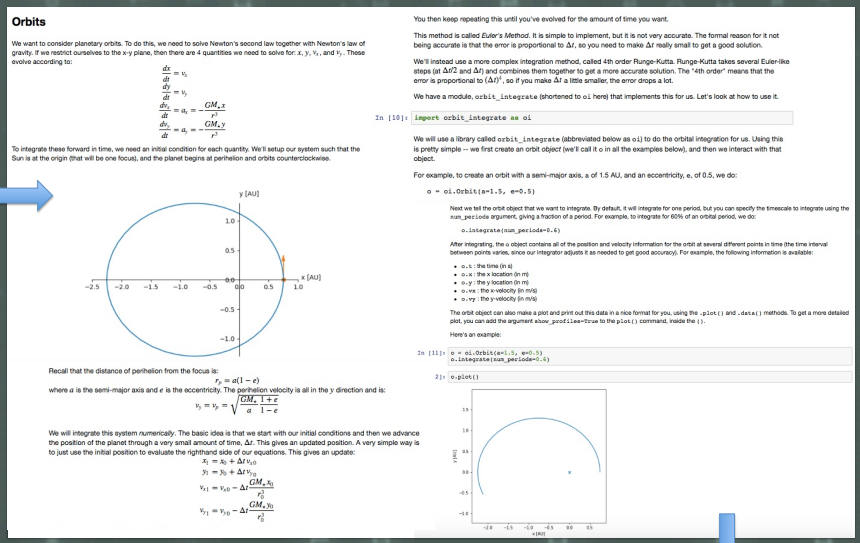
Aligned with AAPT recommendations to incorporate computational physics into the curriculum, we prepared a coding exercise about the verification of Kepler's laws and offered it to our second semester calculus-based physics students as an in-class laboratory activity. The exercise is coded in Python using Jupyter notebooks. The notebooks are placed in a github repository, and are deployed to the students via mybinder.org. Binder opens the notebooks in a browser for the students, avoiding the need to install any software. During the two hours lab, students followed the instructions in the notebook, which gradually introduced them to Python commands, and explained the 4th order Runge-Kutta integration method applied to calculate orbits. Students are guided in gradual steps on how to add lines to the code, change initial conditions and run the integration for new orbits to collect data. The information collected is used to write a lab report on the verification of Kepler's three laws.

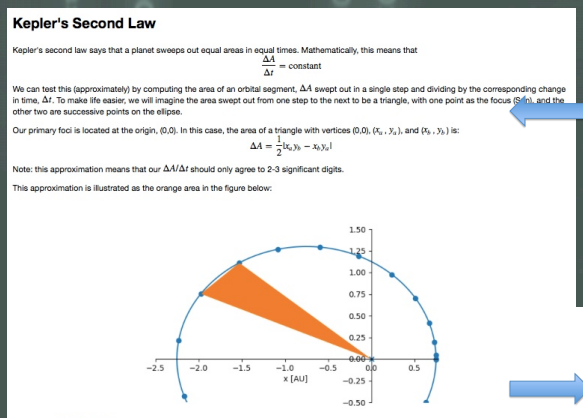
https://github.com/zingale/orbits

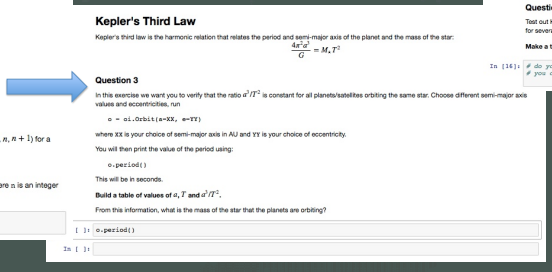




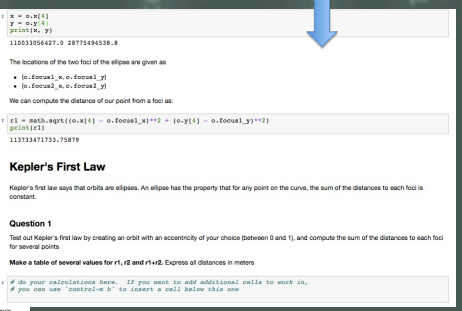








Recently mybinder.org has not been working reliably.
We will explore other notebook server alternatives such as
https://notebooks.azure.com/



Data collection handout: