P486 GRADING RUBRIC

Category	Generic Criteria	Problem Specific Criteria	Comments	Score
Physical Transcription	Physical model is introduced, and parameterized to exploit symmetries and appropriate spatial and temporal scales. Computational algorithm is explained, including any approximations and the method of discretization.	Write-up provides a thorough and accurate description of the physical model and equations of motion an object in a 2+ body gravitational system. The conceptual meaning, units, and symbolic notation is explained for all variables. The methods used for numerical calculations are described, including the methods used to analyze the energy and stability of the system over time.		/2
Planning	Program is written in a modular manner, either using functions or comments to divide code into segments that can be understood and tested separately. *Data elements are matched to the goal and method of the calculation.*	Program includes at least one function devoted to updating the position and velocity of one or all of the bodies in the system for each step in its trajectory.		/2
Implementation	Code, as provided to instructor, *is consistently and clearly commented*. Inputs, variables and function names are descriptive and indicative of their contents and purpose.	Code was provided to instructor, is consistently and clearly commented, and descriptive names are used for inputs, variables + functions.		/2
Testing	Evidence is provided that the algorithm works correctly, as validated by known solutions. Sample outputs submitted to instructor are accurately calculated.	The write-up provides at least one check against the properties of a known orbit (ie, demonstrating that the periods of the bodies involved are accurately preserved, etc.)		/2
Running	*Initial conditions are chosen judiciously. Output is organized and labeled and input parameters used in each run are recorded. Multiple runs, if necessary, are automated efficiently through scripts.*			/2
Visualization	Figures well designed, clear & easy to parse, and direct the readers attention to the most relevant information. Text is easy to read. Visual elements (symbols, lines, colors, etc.) are defined and have a professional appearance.	Figures are formatted in a consistent way to maximize the ability to compare changes when masses of bodies in the system are adjusted; resolution of figures is sufficiently high to reveal changes in orbital properties over time (ie, ensuring line widths are not larger than distance between adjacent orbits etc.)		/2
Numerical Analysis	Dominant source of numerical error is identified and quantified. Solution's convergence is demonstrated, placing quantitative limits on numerical effects due to finite discretization, iteration, or realization.	Numerical accuracy is demonstrated by convergence tests and/or comparison to analytic solutions or limiting/known cases.		/2
Physical Analysis	System's adherence to physical constraints (i.e., limiting cases, conservation laws) are verified. Results are compared to initial hypothesis or goal, and interpreted in context of initial physical model.	The physical accuracy of the code is validated by demonstrating the precision with which energy and momentum are conserved in the simulation. Write-up also analyzes the stability of the system in question as a function of the mass of the changing body.		/2
Written Presentation	Text professionally written? Write-up well organized? Sections labelled & in sensible order? Figures well placed w.r.t relevant text?	Write-up is well organized and clearly written. Sections are well labelled, and all figures are provided with descriptive captions, and referenced in the text.		/4
			Total Score	/20