

Category	Generic Criteria	Problem Specific Criteria	Comments	Score
Physical Transcription	<u>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.</u>	Write-up provides a thorough and accurate description of the physical model of projectile motion w/ drag. The methods used for numerical calculations are described, particularly the decomposition of the acceleration due to drag into its vector components and the measurement of the time at which a given projectile hits the ground. The conceptual meaning, units, and symbolic notation is explained for all variables.		/2
Planning	<u>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.</u>	Program includes at least one function devoted to updating the properties of the projectile at each step in its trajectory.		/2
Implementation	<u>Code, as provided to instructor, is consistently and clearly commented. Inputs, variables and function names are descriptive and indicative of their contents and purpose.</u>	Code was provided to instructor, is consistently and clearly commented, and descriptive names are used for inputs, variables + functions.		/2
Testing	<u>Evidence is provided that the algorithm works correctly, as validated by known solutions. Sample outputs submitted to instructor are accurately calculated.</u>	Table of requested trajectory is provided and accurate.		/2
Running	<i>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.</i>			/2
Visualization	<u>Figures well designed, clear &amp; 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.</u>	The time difference in the impact of the two projectiles is shown as directly as possible. Information/figures for different launch angles are shown on the same plot when possible, or formatted consistently when separate plots are required, to allow differences to be interpreted as quickly and intuitively as possible.		/2
Numerical Analysis	<u>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.</u>	Numerical accuracy is demonstrated by convergence tests and/or comparison to analytic solutions or limiting/known cases.		/2
Physical Analysis	<u>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.</u>	The physical accuracy of the code is demonstrated by demonstrating a near-zero time difference for horizontal launch angles when drag is turned off. Write-up also analyzes time difference for the horizontal case first, and then considers the variation in the time difference as a function of launch angle.		/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