Numerical Methods for the Solution of Differential Equations (AM 213B)

Homework 2 - grading form

Name: Dante Buhl

Final score: 97/100

Point allocation explanation

Question 1 (30/30 points): Student found the correct value of Δt^* up to 8 decimal places. The method described to obtain this value is conceptually correct. An accurate plot for the region of absolute stability is included in the PDF, and 3 different plots for the solutions of the ODE for varying values of Δt. Plots are accurate and portray the conditional absolute stability inherent to this method.

Question 2 (20/20 points): Student references the Covergence Theorem and uses Taylor expansion to show consistency with order three. Zero-stability is also investigated correctly. Student correctly plots the Region of Absolute Stability and arrives at the conclusion that BDF3 is not A-Stable for the same reason mentioned in the solution.

Question 3 (30/30 points): Student correctly computes the consistency order for the LMM and shows it is consistent. Zero-unstability is also shown correctly and student arrives at the conclusion that the method is therefore not convergent. Student also uses theoretical and numerical evidence to show that this LMM is unconditionally absolutely unstable.

Question 4 (17/20 points): Student does not write out the RK3 scheme explicitly. Student shows consistency, zero-stability, and convergence for the RK3 method. The method of proving consistency given in the solution is contained in the students work. Student confirms that the RK3 method is in fact not A-stable, by showing that its region of absolute stability does not contain in whole $\mathbb{C}^{-1}$. Plot given for the region of absolute stability is messy, but its caption clarifies where the region of asbolute stablility is given and it is an accurate representation.