MACM 316 - Computing Assignment 3

- Read the *Guidelines for Assignments* first.
- Submit a one-page PDF report to Crowdmark and upload your Matlab scripts (as m-files) to Canvas. *Do not use any other file formats*.
- Keep in mind that Canvas discussions are open forums.
- You must acknowledge any collaborations/assistance from colleagues, TAs, instructors etc.

Part A:

The following three methods are proposed to compute $11^{1/6}$. Using Matlab, determine if they converge and for the convergent methods rank them in order, based on their apparent speed of convergence, assuming $p_0 = 2$.

Method 1: $\qquad p_n = p_{n-1} - \dfrac{p_{n-1}^6 - 11}{6p_{n-1}^5}.$

Method 2: $\qquad p_n = p_{n-1} - \dfrac{p_{n-1}^6 - 11}{20}.$

Method 3: $\qquad p_n = p_{n-1} - \dfrac{p_{n-1}^6 - 11}{24}.$

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Part B:

Present a table or plots of the absolute error $|p_n - p|$ against n to further illustrate the convergence or divergence of the iterations in **Part A**.

Part C:

Using your computed errors, estimate the order of convergence α and the asymptotic error constant λ for each convergent iteration. Explain clearly how you compute each constant. As part of your explanation, you may wish to refer to your table or plot(s) from **Part B**, or introduce a new table or plot.

There are several possible ways to compute the constants. Some methods are better than others, and will be assigned higher grades.

NOTES:

- See Definition 2.7 on page 78 of the text for the definition of α and λ.

- Refer to the Guidelines for Computing Assignments for general rules, requirements on written communication, information on the graphical presentation, and the grading scheme.

- Remember that you will be marked based on your report so make sure that it includes all of your results. We do not normally access your submitted Matlab scripts, but we may if we have academic integrity or other concerns.

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Submit your 1 page report for this question to Crowdmark in .pdf format according the Assignment Guidelines described in the syllabus.

Submit your Matlab code to Canvas "Computing Assignment 3 - Matlab Code". Do not include identifying information on your report.

After marking, we will post a few exemplary reports as sample solutions. We appreciate your support on this. If you do not wish to have your report posted, please state so at the top of your report.

Grades will be based on 4 criteria:

Writing / Clarity and conciseness:
   2 marks: Writing is clear and concise
   1 mark: Contains minor spelling or grammatical errors, too brief or too long, does not convey the main ideas
   0 marks: Writing quality is poor and cannot be understood easily or at all

Data / Figures or Tables:
   2 marks: Data is correct, clearly presented in a table or figure, and relevant to the report
   1 mark: Some data is missing, unimportant data is included
   0 marks: No data, data is incorrect / irrelevant

Speed of Convergence:
   2 marks: Relative convergence of methods is correct and clearly presented
   1 mark: Answer given but discussion contains small errors or is incomplete
   0 marks: Values or discussion missing, incomplete, and/or incorrect

Computed constants:
   4 marks: Complete and correct analysis and discussion
   2 marks: Appropriate values given but discussion contains small errors or is incomplete.
   0 marks: Analysis and discussion missing, incomplete, and/or incorrect