KUTAISI INTERNATIONAL UNIVERSITY

Numerical Programming

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AP#2

Floating points, finite differences, errors

Problem 1.1

- Finite differences in one spatial dimension (for students minoring in MGMT)
- Floating point arithmetics and errors (for everyone)
- Finite differences in two spatial dimensions (for students minoring in Math)

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Tasks:

1. Floating point arithmetics and errors:
   - Demonstrate innacurate calculations by computer due to finite precision arithmetics.
   - For developing test case you can explore round off errors, underflow, overflow, violation of associative property etc.
   - post your example in the chat to ensure others do not address the same problem
2. Finite differences in one and two spatial dimensions
   - 2.1 Consider finite differences formulas of different precision
   - 2.2 Visualize errors using tangent line and tangent plane
   - 2.3 Let discretization step to go to zero and observe behavior of the error
   - 2.4 Analyze data and draw conclusions
3. Explanations of tests and conclusions should be provided in writing.

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Important Notice

- AP assigned 0 points if:
  - a model problem provided twice by students. Make sure, your model is different from models given by others.
  - submitted results are not reproducible
  - student cannot apply his own code for the input data provided by TA or instructor