Scientific Computing
Lecture 4

Exam questions

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Questions

- Write down the forms of differential operator for Ordinary Differential Equation and for Partial Differential Equation. Explain the difference between them.
- Explain the meaning of terms: Linear differential equation, Quasi-linear differential equation, Non-linear differential equation.
- How the ODE of k^{th} order can be replaced with a system of ODE of the first order?
- List three kinds of problems for differential equations. Explain each of them in a few words.
- What is the Cauchy problem? Describe it with an example.
- What is the boundary value problem? Describe it with an example.
- What is the eigenvalue problem? Describe it with an example.
- When the Cauchy problem is well-posed?
- List three general approaches for solution of the Cauchy problem. Explain in few words advantages and disadvantages of them.
- What is explicit and implicit schemes for solving the Cauchy problem? Explain advantages and disadvantages for all of them.
- Explain the idea of Euler's method.
- Explain the idea of Shooting method.
- Explain the main idea of Galerkin methods.
- Write at least two examples of problems leading to the partial differential equations of the first order.
- Can the Cauchy problem be stated for the partial differential equation? If yes, give an example of it.
- Describe the main idea of statement of N-body problem.
- Describe the main idea of the Molecular dynamics method.