

Numerical methods for ODE

1. Heat conduction equation and its semi-discretization, qualitative properties.
2. Stability, stiff systems of ODE.
3. Taylor method as numerical method.
4. Explicit Euler method and its properties. (Consistency and convergence on uniform and non-uniform meshes.)
5. Implicit Euler method, trapezoidal method. Consistency and convergence.
6. Absolute stability, A-stable numerical methods. (Stability domain of the methods, A-stability of the linear systems, example of the semi-discretized heat equation.)
7. Basic of the Runge-Kutta methods. (Basic idea, some simple methods.)
8. Runge-Kutta methods in general form. (Butcher tableau, conditions of the consistency, relation between the stage and order numbers, convergence.)
9. Absolute stability of the Runge-Kutta methods. Embedded methods.

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