Exercise Sheet 2

winter term 2026/27

Discussion on 26.10.2026

Exercise 1. If Φ is Lipschitz continuous in the third entry, one can use

$$\tilde{C}(t_k, z_k, \tau) := \frac{z(t_{k+1}) - z_k}{\tau} - \Phi(t_k, z_k, z(t_{k+1}), \tau)$$

instead of $C(t_k, z_k, \tau)$ to determine the order of consistency.

Exercise 2. Derive the Butcher tableaux of the implicit mid point scheme, the Euler-Collatz method, the implicit trapezoidal scheme and Heun's method (see Example 3.2).

Exercise 3. Determine the consistency of the implicit midpoint scheme.

Exercise 4 (Programming exercise)**.** Make yourself familiar with the program `ODE_solver.jl` from the website of the lecture and let the program run.