

Numerical Analysis II

Homework Sheet 11

Exercises

Tutorial on July 7

1. Problem

Derive a shooting method for the physical problem of the trajectory of a projectile and solve this problem.

2. Problem

Derive a shooting method for the linear boundary value problem

$$\begin{cases} (\mathcal{L}y)(x) := -y''(x) + b(x)y'(x) + c(x)y(x) = f(x) \\ y(a) = \alpha, \quad y(b) = \beta. \end{cases}$$

If the used initial value problem solver is convergent of order p , is the shooting method also convergent? If so, of what order?

3. Problem

In order to solve the boundary value problem $y'(x) = 2y(x) + 1, x \in [0, 1]$, with the terminal condition $y(1) = -1/2 - e^2/2$, split up the interval $[0, 1]$ into m equidistant intervals and construct the system $F(s) = 0$ that is obtained by applying a multiple shooting method. The initial value problems on the smaller intervals are to be solved exactly. Show that $F(s) = 0$ is uniquely solvable.

No Theoretical Homework