

Numerical Analysis of Ordinary Differential Equations Programming Exercises

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Exercise sheet 5
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Exercise P5.1 (Single shooting)

Consider the following boundary value problem

$$u'(t) = \left(6t(t-1)u_2(t) - u_1^2(t) + t^4 + 10t^3 - 17t^2 + 6t - 2 \right), \quad t \in (0, 1)$$
$$u_1(0) = u_1(1) = 0.$$

Solve this BVP with a single shooting approach. For the numerical approximation of the initial value problems use the explicit Euler method with step size $h = 1/30$. As start values for the single shooting approach use first $s^{(0)} = 1$ and afterwards $s^{(0)} = 20$. Plot the solutions.