Applied Numerical Methods - Computer Lab 1

Goyens Florentin & Weicker David

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Part 1. Solution of ODE-systems with constant coefficients

In the electrical circuit that follows, we define the variable $\dot{q} = i$. dessin du circuit to come The RLC circuit is described by the equation

$$L\ddot{q} + R\dot{q} + \frac{1}{C}q = E, \qquad q(0) = 0, \qquad \dot{q}(0) = 0.$$

We easily rewrite this as a first order system of linear equations. Setting $y_1 = q$ and $y_2 = \dot{q}$, this gives

$$\begin{aligned} \dot{y_1} &= y_2 \\ \dot{y_2} &= -\tfrac{R}{L}y_2 - \tfrac{1}{LC}y_1 + E \end{aligned}$$

$$\begin{pmatrix} \dot{y_1} \\ \dot{y_2} \end{pmatrix} = \begin{pmatrix} 0 & 1 \\ -\frac{1}{LC} & -\frac{R}{L} \end{pmatrix} + \begin{pmatrix} 0 \\ E \end{pmatrix}$$

Part 2. Stability of ODE-systems and equilibrium points

a. Stability of the solutions of an ODE-system of LCC-type

b. Stability of the critical points of a nonlinear ODE-system