

Differential Equations I for Students of Engineering Sciences

Sheet 1, Exercise class

Exercise 1:

Let $y(t)$ be the number of common vole in a given region at time t . In a very simple model it is assumed that the increase of the number of mice per time unit is proportional to the number of mice.

- Derive a difference equation which approximately describes the development of the number of mice in a short period of time.
- Describe the development of the number of mice using a differential equation.
- Can you determine the number of mice at time $t = 10$ (depending on some proportionality factor, of course)?

Which information do you miss?

Exercise 2:

We look for functions $y : \mathbb{R} \rightarrow \mathbb{R}$, $t \mapsto y(t)$ with

$$y'''(t) + 2y''(t) - y'(t) - 2y(t) = 0,$$

i.e. solutions of the differential equation

$$y''' + 2y'' - y' - 2y = 0.$$

With the help of the ansatz $y(t) = ke^{\lambda t}$, k, λ constant, determine solutions of this differential equation different from the zero function.

Dates of classes: 16.10.-20.10.2023