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Dr. Michael Junk
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WS 1999/00

Tutorial *Dynamical Systems: Theory and Numerics*

Return: 12:00, Friday, 12.11. metal box: Junk/Jungemann (48, ground floor)

Exercise 6:

To find a special solution of the equation $y' + g(x)y = h(x)$, one can use the solution $y_{hom}(x) = C\exp(-\int_\xi^x g(t)\,dt)$ of the homogeneous problem (Exercise 3a), replacing the constant C by a function $C(x)$ (method of variation of constants). A general solution is obtained by adding y_{hom} to the special solution.

a) How has $C(x)$ to be chosen ?

b) Find the general solution of $y' + y\sin x = \sin^3 x$.

Exercise 7:

The differential equation $y' + g(x)y + h(x)y^\alpha = 0$ with $\alpha \neq 1$ is called *Bernoulli's equation.*

a) Assuming that $y > 0$, show that the transformation $z = y^{1-\alpha}$ leads to a linear differential equation.

b) Apply the approach to $y' + \frac{y}{1+x} + (1+x)y^4 = 0$ with $y(0) = 1$.

c) Apply the approach to $y' = x^4 y + x^4 y^4$ with $y(0) = 1$.

Some organizing ...

- You can work on the problems in groups (up to three students per group).
- Each group has to return one answer sheet.
- Changing the groups should be avoided.
- Your group should decide on one of the following tutorials:
  - Monday 10:00 Room 13/222 (Junk) **or**
  - Thursday 17:15 Room 48/582 (Jungemann)
- You can download the problem sheets at
  `http://www.mathematik.uni-kl.de/ junk/ode_tutorials.html`