Differential Equations I
for Students of Engineering Sciences

Sheet 3, Exercise class

Exercise 1:

Consider the the initial value problem

$$y'''(t) - 2y''(t) - y'(t) + 2y(t) = 3\sin(t), \qquad y(0) = 0,\ y'(0) = 1,\ y''(0) = \frac{3}{10}.$$

be given.

  a) Which order has the differential equation ?

  b) Is it an explicit differential equation ? If not provide an equivalent explicit differential equation.

  c) Is the differential equation linear?

  d) Is the differential equation homogeneous?

  e) Rewrite the initial value problem into an equivalent initial value problem for a system of first order.

Exercise 2:

Determine the solutions of the following initial value problems

  a)
$$y'(t) = \frac{1 + \cos(t)}{(y(t))^2} \qquad \text{for } t > 0, \qquad y(0) = 3.$$

  b)
$$y - ty' = \frac{t^3}{y^2} \qquad \text{for } t > 1, \qquad y(1) = 2.$$

  Hint: Substitute $u(t) := \frac{y(t)}{t}$.

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