



MMP I

Tutorial 6

HS 2019
Prof. M. Grazzini

S. Devoto, M. Höfer, J. Yook
<https://www.physik.uzh.ch/en/teaching/PHY312/HS2019.html>

Issued: 22.10.2019
Due: 29.10.2019 10:15

Exercise 1: Homogenous systems of differential equations (4 Pts.)

Solve the following homogenous systems of linear differential equations:

a)

$$\begin{cases} x' = 2x - y - z \\ y' = -x + 3y - z - w \\ z' = -x - y + 3z - w \\ w' = -y - z + 2w \end{cases}$$

b)

$$\begin{cases} x' = x \\ y' = 2x + 2y + z \\ z' = 3x + z \end{cases}$$

Exercise 2: Non-homogenous systems of differential equations (4 Pts.)

Solve the following non-homogenous systems of linear differential equations:

a)

$$\begin{cases} x' = -\frac{5}{4}x + \frac{3}{4}y + \frac{2}{1+e^t}, & x(0) = 2 \\ y' = \frac{3}{4}x - \frac{5}{4}y, & y(0) = 0 \end{cases}$$

b)

$$\begin{cases} x' = 4x + 2y - 15te^{-2t}, & x(0) = 7 \\ y' = 3x - y - 4te^{-2t}, & y(0) = 3 \end{cases}$$

Exercise 3: Dido's problem (4 Pts.)

Given a rope with fixed length l and a line segment with length $d < l$, find the shape of the rope such that the area enclosed by the rope and the segment is maximal.