NMAI057 – Linear algebra 1

Tutorial 1

Date: September 29, 2021 TA: Denys Bulavka

Problem 1. List as many ways as possible to specify a line in space. Discuss the assumptions and limitations of individual approaches.

Problem 2. Find a linear equation defining the plane given by the point $[3, 2, 1]$ and the slopes $(1, 1, 1)$, $(2, -1, 0)$.

Problem 3. Find a parametric description of the plane defined by the linear equation $2x_1 + 3x_2 + x_3 = 4$.

Problem 4. Find a parametric description of the line given by the two equations:

$$x_1 + 3x_2 + x_3 = 2, \quad 2x_1 + 5x_2 + x_3 = 3.$$

Problem 5. Find two equations defining the line $[3, 2, 1] + t(1, -1, 1)$, where $t \in \mathbb{R}$.

Problem 6. Determine all possible mutual positions of two lines in the space $\mathbb{R}^3$. Next, describe how the positions can be determined if both lines are defined parametrically or by equations.

Problem 7. Determine the relative position of the two lines given by a point and a slope

$$p : [1, 5, 3],\ (1, -2, -2), \quad q : [3, 1, -1],\ (-1, 2, 2).$$

Problem 8. Interpolate a quadratic function through the points $[1, 1]$, $[2, 2]$, $[3, 7]$.