Fachrichtung 6.1 – Mathematik
Wintersemester 2015/16
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Refresher course for the entrance test in MINT studies
Exercise sheet 2

Exercise 1. Solve the following systems of equations. (Use matrix notation and the Gauß algorithm. How many solutions are there?)

$$\begin{aligned} x_1 + x_2 + x_3 &= 3 \\ x_1 + 2x_2 + 3x_3 &= 6 \end{aligned}$$

$$\begin{aligned} x_2 - 2x_3 &= 6 \\ 2x_1 + 6x_2 + 4x_3 &= 8 \\ x_1 + 4x_2 &= 10 \end{aligned}$$

$$\begin{aligned} x_1 + x_2 + x_3 + x_4 &= 4 \\ x_1 - x_2 - x_3 + x_4 &= 0 \\ 3x_1 - x_2 - x_3 + 3x_4 &= 2 \end{aligned}$$

$$\begin{aligned} x_1 + x_3 &= 0 \\ 2x_1 + x_2 + 2x_4 &= 0 \\ x_2 - x_4 &= 4 \\ x_1 - x_2 - x_3 + x_4 &= -2 \\ 3x_1 + x_2 + x_3 + 2x_4 &= 0 \end{aligned}$$

$$\begin{aligned} 3(2x_1 - x_2) + 4(x_1 - 2x_2) &= 87 \\ 2(3x_1 - x_2) - 3(x_1 - x_2) &= 82 \end{aligned}$$

Exercise 2. Here is a system of equations in two variables x_1, x_2 with one parameter $a \in \mathbb{R}$. Solve the system (this means describe the solutions as functions of a). How does the number of solutions depend on a?

$$\begin{aligned} x_1 + x_2 &= a \\ ax_1 - x_2 &= 1 \end{aligned}$$

Exercise 3. *For fun!*
When I was born, my father was 36 years old. In 3 years, I will have half the age of my father. How old am I? (This is a system of linear equations!)