1 An Example for Gaussian Elimination

Consider the real matrix

$$A(t) := \begin{pmatrix} 1 & 1 & 1 \\ t & 2t & 2 \\ t+1 & 0 & 2t \end{pmatrix},$$

which depends on a real valued parameter t. We want to find all solutions of the homogenous linear system defined by A depending on the parameter t.

Therefore, we use the Algorithm Gauss:

$$A(t) = \begin{pmatrix} 1 & 1 & 1 \\ t & 2t & 2 \\ t+1 & 0 & 2t \end{pmatrix} \begin{matrix} \urcorner^{-t} \\ \leftarrow\!\lrcorner_{+} \\ \leftarrow\!\!\!\!\!\!\lrcorner_{+} \end{matrix}^{-(t+1)} \rightsquigarrow \begin{pmatrix} 1 & 1 & 1 \\ 0 & t & 2-t \\ 0 & -t-1 & t-1 \end{pmatrix} \begin{matrix} \\ \\ \leftarrow\!\lrcorner_{+} \end{matrix} \mid \cdot(-1)$$

$$\rightsquigarrow \begin{pmatrix} 1 & 1 & 1 \\ 0 & t & 2-t \\ 0 & 1 & -1 \end{pmatrix} \begin{matrix} \leftarrow\urcorner \\ \leftarrow\!\lrcorner\urcorner^{-t}_{+} \\ \\ \end{matrix} \mid :2$$

$$\rightsquigarrow \begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix}.$$

Conclusion

We have learned that the matrix A defined above is regular for all real valued t, and we hopefully also have learned how to use the gauss package.