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:

$$\begin{aligned} A(t) = \begin{pmatrix} 1 & 1 & 1 \\ t & 2t & 2 \\ t+1 & 0 & 2t \end{pmatrix} \begin{array}{ll} -t & -(t+1) \\ + & \\ & + \end{array} &\rightsquigarrow \begin{pmatrix} 1 & 1 & 1 \\ 0 & t & 2-t \\ 0 & -t-1 & t-1 \end{pmatrix} \begin{array}{l} \\ \\ + \quad | \cdot (-1) \end{array} \\ &\rightsquigarrow \begin{pmatrix} 1 & 1 & 1 \\ 0 & t & 2-t \\ 0 & 1 & -1 \end{pmatrix} \begin{array}{l} \\ -t \\ + \quad | : 2 \end{array} \\ &\rightsquigarrow \begin{pmatrix} 1 & 1 & 1 \\ 0 & 1 & -1 \\ 0 & 0 & 1 \end{pmatrix}. \end{aligned}$$

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.