

```

> # Aufgabe 8.2
> restart;
> with(LinearAlgebra);
> A := <<1|2|0|-1>,<2|2|a|3>,<-4|3|2|a+1>,<7|-1|0|5>>;

```

$$A := \begin{bmatrix} 1 & 2 & 0 & -1 \\ 2 & 2 & a & 3 \\ -4 & 3 & 2 & a+1 \\ 7 & -1 & 0 & 5 \end{bmatrix} \quad (1)$$

```

> dA := Determinant(A);

```

$$dA := -15a^2 - 87a + 102 \quad (2)$$

```

> solve(dA = 0, a);

```

$$-\frac{34}{5}, 1 \quad (3)$$

```

> # A ist invertierbar ausser fuer a = -34/5 und fuer a=1
> A1 := eval(A,a=1);

```

$$A1 := \begin{bmatrix} 1 & 2 & 0 & -1 \\ 2 & 2 & 1 & 3 \\ -4 & 3 & 2 & 2 \\ 7 & -1 & 0 & 5 \end{bmatrix} \quad (4)$$

```

> Rank(A1);

```

$$3 \quad (5)$$

```

> ColumnSpace(A1);

```

$$\left[\left[\begin{bmatrix} 1 \\ 0 \\ 0 \\ -1 \end{bmatrix}, \begin{bmatrix} 0 \\ 1 \\ 0 \\ 2 \end{bmatrix}, \begin{bmatrix} 0 \\ 0 \\ 1 \\ -1 \end{bmatrix} \right] \right] \quad (6)$$

```

> NullSpace(A1);

```

$$\left[\left[\begin{bmatrix} -\frac{3}{5} \\ \frac{4}{5} \\ -\frac{17}{5} \\ 1 \end{bmatrix} \right] \right] \quad (7)$$

```

> A2 := eval(A, a=-34/5);

```

(8)

$$A2 := \begin{bmatrix} 1 & 2 & 0 & -1 \\ 2 & 2 & -\frac{34}{5} & 3 \\ -4 & 3 & 2 & -\frac{29}{5} \\ 7 & -1 & 0 & 5 \end{bmatrix} \quad (8)$$

> b := <3,4,-1,6>;

$$b := \begin{bmatrix} 3 \\ 4 \\ -1 \\ 6 \end{bmatrix} \quad (9)$$

> x := LinearSolve(A2, b, free='s');

$$x := \begin{bmatrix} 1 - \frac{6s_3}{5} \\ 1 + \frac{8s_3}{5} \\ s_3 \\ 2s_3 \end{bmatrix} \quad (10)$$

> A2 . x - b; # Probe

$$\begin{bmatrix} 0 \\ 0 \\ 0 \\ 0 \end{bmatrix} \quad (11)$$