

1. a.
$$\left[\begin{array}{ccccc|c} 2 & 1 & -3 & 6 & 13 & \\ -1 & 1 & 1 & -8 & -4 & \\ 1 & 0 & 3 & -4 & -3 & \\ 1 & 2 & 1 & -8 & 3 & \end{array} \right] \begin{array}{l} \leftarrow R_1 = R_3 \\ \leftarrow R_3 = R_1 \end{array}$$

$$\begin{array}{cccc|c} u & x & y & z & \\ \hline 1 & 0 & 0 & 2 & 3 \\ 0 & 1 & 0 & -4 & 1 \\ 0 & 0 & 1 & -2 & -2 \\ 0 & 0 & 0 & 0 & 0 \end{array}$$

$x = 4z + 1 \quad u = -2z + 3$

$$\left[\begin{array}{ccccc|c} 1 & 0 & 3 & -4 & -3 & \\ -1 & 1 & 1 & -8 & -4 & +R_1 \\ 2 & 1 & -3 & 6 & 13 & -2R_1 \\ 1 & 2 & 1 & -8 & 3 & -R_1 \end{array} \right]$$

b. $w + 2z = 3$
 $x - 4z = 1$
 $y - 2z = -2$
 $z = \text{frei wählbar}$

$$\begin{bmatrix} w \\ x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 1 \\ -2 \end{bmatrix} + z \begin{bmatrix} -2 \\ 4 \\ 2 \end{bmatrix}$$

$$\left[\begin{array}{ccccc|c} 1 & 0 & 3 & -4 & -3 & \\ 0 & 1 & 4 & -12 & -7 & \\ 0 & 1 & -9 & 14 & 19 & -R_2 \\ 0 & 2 & -2 & -4 & 6 & -2R_2 \end{array} \right]$$

$$\left[\begin{array}{ccccc|c} 1 & 0 & 3 & -4 & -3 & \\ 0 & 1 & 4 & -12 & -7 & \\ 0 & 0 & -13 & 26 & 26 & R_3 = -\frac{1}{13}R_3 \\ 0 & 0 & -10 & 20 & 20 & \end{array} \right]$$

$$\left[\begin{array}{ccccc|c} 1 & 0 & 3 & -4 & -3 & \\ 0 & 1 & 4 & -12 & -7 & \\ 0 & 0 & 1 & -2 & -2 & \\ 0 & 0 & -10 & 20 & 20 & +10R_3 \end{array} \right]$$

$$\left[\begin{array}{ccccc|c} 1 & 0 & 3 & -4 & -3 & -3R_3 \\ 0 & 1 & 4 & -12 & -7 & -4R_3 \\ 0 & 0 & 1 & -2 & -2 & \\ 0 & 0 & 0 & 0 & 0 & \end{array} \right]$$