

$$\begin{aligned}
& \begin{pmatrix} \textcolor{red}{1} & 3 & -1 & 2 \\ -2 & -6 & 3 & 1 \\ 3 & 10 & -2 & 3 \end{pmatrix} \\
& \sim \begin{pmatrix} \textcolor{red}{1} & 3 & -1 & 2 \\ 0 & 0 & 1 & 5 \\ 0 & 1 & 1 & -3 \end{pmatrix} \quad \begin{bmatrix} L_2 & \longleftarrow & L_2 + 2L_1 \\ L_3 & \longleftarrow & L_3 - 3L_1 \end{bmatrix} \\
& \sim \begin{pmatrix} \textcolor{red}{1} & 3 & -1 & 2 \\ 0 & \textcolor{red}{1} & 1 & -3 \\ 0 & 0 & \textcolor{red}{1} & 5 \end{pmatrix} \quad L_2 \longleftrightarrow L_3 \\
& \sim \begin{pmatrix} \textcolor{red}{1} & 3 & 0 & 7 \\ 0 & \textcolor{red}{1} & 0 & -8 \\ 0 & 0 & \textcolor{red}{1} & 5 \end{pmatrix} \quad \begin{bmatrix} L_1 & \longleftarrow & L_1 + L_3 \\ L_2 & \longleftarrow & L_2 - L_3 \end{bmatrix} \\
& \sim \begin{pmatrix} \textcolor{red}{1} & 0 & 0 & 31 \\ 0 & \textcolor{red}{1} & 0 & -8 \\ 0 & 0 & \textcolor{red}{1} & 5 \end{pmatrix} \quad L_1 \longleftarrow L_1 - 3L_2
\end{aligned}$$

$$\begin{aligned}
& \left(\begin{array}{ccc|c} \textcolor{red}{1} & 3 & -1 & 2 \\ -2 & -6 & 3 & 1 \\ 3 & 10 & -2 & 3 \end{array} \right) \\
& \sim \left[\begin{array}{l} L_2 \longleftarrow L_2 + 2L_1 \\ L_3 \longleftarrow L_3 - 3L_1 \end{array} \right] \\
& \left(\begin{array}{ccc|c} \textcolor{red}{1} & 3 & -1 & 2 \\ 0 & 0 & 1 & 5 \\ 0 & 1 & 1 & -3 \end{array} \right) \\
& \sim L_2 \longleftrightarrow L_3 \\
& \left(\begin{array}{ccc|c} \textcolor{red}{1} & 3 & -1 & 2 \\ 0 & \textcolor{red}{1} & 1 & -3 \\ 0 & 0 & \textcolor{red}{1} & 5 \end{array} \right) \\
& \sim \left[\begin{array}{l} L_1 \longleftarrow L_1 + L_3 \\ L_2 \longleftarrow L_2 - L_3 \end{array} \right] \\
& \left(\begin{array}{ccc|c} \textcolor{red}{1} & 3 & \textcolor{blue}{0} & 7 \\ 0 & \textcolor{red}{1} & \textcolor{blue}{0} & -8 \\ 0 & 0 & \textcolor{red}{1} & 5 \end{array} \right) \\
& \sim L_1 \longleftarrow L_1 - 3L_2 \\
& \left(\begin{array}{ccc|c} \textcolor{red}{1} & \textcolor{blue}{0} & \textcolor{blue}{0} & 31 \\ 0 & \textcolor{red}{1} & \textcolor{blue}{0} & -8 \\ 0 & 0 & \textcolor{red}{1} & 5 \end{array} \right)
\end{aligned}$$