The Gaussian Elimination Technique

Suppose we have a linear system $AX = B$. Then the solution of the system is determined as follows:

1. Form the augmented matrix $[A{:}B]$.
2. Transform this augmented matrix to row echelon form using the 3 elementary row operations.
3. Each non-zero row determines a solution to one of the unknowns (via back substitution).

The Gauss-Jordan Reduction Technique

Suppose we have a linear system $AX = B$. Then the solution of the system is determined as follows:

1. Form the augmented matrix $[A{:}B]$.
2. Transform this augmented matrix to reduced row echelon form using the 3 elementary row operations.
3. Each non-zero row determines a solution to one of the unknowns (via back substitution).

Examples:

1.
$$\begin{aligned} x + 2y + 3z &= 9 \\ 2x - y + z &= 8 \\ 3x \quad\quad - z &= 3 \end{aligned}$$

2.
$$\begin{aligned} x + y + 2z &= -1 \\ x - 2y + z &= -5 \\ 3x + y + z &= 3 \end{aligned}$$

3.
$$\begin{aligned} x + y + z + w &= 6 \\ 2x + y - z \quad\quad &= 3 \\ 3x + y \quad + 2w &= 6 \end{aligned}$$