Ch3: Systems of linear equation

→ Solving a linear equation

↳ Echelon form

to solve the systeme:

$$\begin{cases} u_1 x + v_1 y + w_1 z = b_1 \\ u_2 x + v_2 y + w_2 z = b_2 \\ u_3 x + v_3 y + w_3 z = b_3 \end{cases}$$

1. write the augmented matrix:

$$\left[\begin{array}{ccc|c} u_1 & v_1 & w_1 & b_1 \\ u_2 & v_2 & w_2 & b_2 \\ u_3 & v_3 & w_3 & b_3 \end{array}\right]$$

2. Transform the matrix to row echelon form or reduced row echelon form using row operation

3. Find value of (b_1, b_2, b_3) => solution

↳ The systeme can have:

- one unique solution
- infinitely many solution $(0\ 0\ 0 | 0)$ } consistent
- no solution $(0\ 0\ 0 | a)$ } inconsistent

N.B!!

rank : nb of leading 1

→ $r = n$ => unique solution

→ $r < n$ => infinitely many solution

i. LU decomposition

1. Find the LU decomposition
2. Solve the systeme using LU decomposition of A

$(S) : AX = b$

$$\begin{cases} Ly = b \\ Ux = y \end{cases}$$