When det A ($|A|$) = 0 : singular matrix, multiple results are possible for solutions.

→ rank used to make result more precise.

Method :

- Use gaussian row elimination, reduce matrix to echelon form :

$$\begin{pmatrix} 1 & 5 & 0 & 7 \\ 0 & 2 & 8 & 9 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 \end{pmatrix}$$ rank = 2 (2 non-zero rows)

↖ upper triangular form

- Number of non-zero rows in echelon form = rank

↑
ALL ZEROS

e.g $\begin{pmatrix} 1 & 1 & -1 \\ 0 & -3 & 4 \\ 0 & 0 & 0 \end{pmatrix}$ $\begin{pmatrix} 1 & -1 & 1 \\ 0 & 0 & 0 \\ 0 & 0 & 0 \end{pmatrix}$ $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 1 \\ 0 & 0 & 1 \end{pmatrix}$

rank 2   rank 1   rank 3

The number of entirely zero rows represent the Null of the matrix, and is the dimension of the solution set of $Ax = 0$.