

## Rouché–Capelli theorem\*

\* Also known as Kronecker–Capelli theorem and Rouché-Frobenius theorem.

In a linear system of equations:

A = Coefficient matrix.

A\* = Augmented matrix.

$$\left\{ \begin{array}{l} \text{If } R(A) = R(A^*) \Rightarrow \text{Compatible system} \left\{ \begin{array}{l} \text{If } R(A) = R(A^*) = \text{number of unknowns} \rightarrow \\ \text{Determinate system :} \\ \text{Unique solution.} \\ \text{If } R(A) = R(A^*) < \text{number of unknowns} \rightarrow \\ \text{Indeterminate system :} \\ \text{Infinite solutions.} \end{array} \right. \\ \\ \text{If } R(A) \neq R(A^*) \Rightarrow \text{Incompatible system : No solution.} \end{array} \right.$$

Where  $R(x)$  denotes Rank of the  $x$  matrix.