

# Simultaneous Linear Algebraic Equations

$$a_{11}x_1 + a_{12}x_2 + \dots$$

$$a_{1n}x_n = b_1$$

$$a_{21}x_1 + a_{22}x_2 + \dots$$

$$a_{2n}x_n = b_2$$

⋮

$$a_{n1}x_1 + a_{n2}x_2 + \dots$$

$$a_{nn}x_n = b_n$$

} n equations

$x_1, x_2, \dots, x_n$  - n unknowns

$a_{ij}$        $1 \leq i, j \leq n$       constants

$\equiv$

$b_i$        $1 \leq i \leq n$       constants

# Matrix representation

$$\begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix} = \begin{bmatrix} b_1 \\ b_2 \\ \vdots \\ b_n \end{bmatrix}$$

$A$                        $x$                        $b$

$$Ax = b$$

$$\begin{array}{l} x = A \setminus b \\ x = A^{-1} b \end{array} \left. \vphantom{\begin{array}{l} x = A \setminus b \\ x = A^{-1} b \end{array}} \right\} \begin{array}{l} \text{2 ways to solve} \\ \text{for } x. \end{array}$$