

Matrix Equations – Calculation Rules

Calculation Rules

$$A \cdot X = B \quad \Rightarrow \quad X = A^{-1} \cdot B$$

$$X \cdot A = B \quad \Rightarrow \quad X = B \cdot A^{-1}$$

$$A \cdot X \cdot B = C \quad \Rightarrow \quad X = A^{-1} \cdot C \cdot B^{-1}$$

Typical Equations and Their Solutions

Typical Equation	Solution
$X \cdot A \cdot B - A - X \cdot C = D$ <i>X is a left factor.</i>	$X = (A + D) \cdot (A \cdot B - C)^{-1}$
$A + B \cdot X = C \cdot X$ <i>X is a right factor.</i>	$X = (C - B)^{-1} \cdot A$
$A + B \cdot X + X \cdot C = D$ <i>X is both a left and right factor.</i>	This equation cannot be solved explicitly for X .
$A \cdot B + k \cdot X = C$ <i>X is multiplied by a scalar ($k \in \mathbb{R}$).</i>	$X = \frac{1}{k} (C - A \cdot B)$
$A \cdot X - k \cdot X = B$ or $A \cdot X - X \cdot k = B$	$X = (A - k \cdot E)^{-1} \cdot B, \quad k \in \mathbb{R}$ Multiplication by a scalar is commutative.