TEX.py

Thaqib Mo.

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1 Systems of Linear Equations

Theorem 1.1

Let $A \in M_{m \times n}$ and consider the equation

$$A\mathbf{x} = \mathbf{0}$$

Then K_H the set of all solutions to the equation is a subspace of $\mathbb{F}^n$ and

$$\dim K_H = n = \operatorname{rank}(A)$$

Theorem 1.2

Given $A \in M_{n \times m}(\mathbb{F})$ and $b \in \mathbb{F}^m$ let

$$K = \{x \mid Ax = b\} \quad K_H = \{x \mid Ax = 0\}$$

Then for any solution c of $Ax = b$ we have

$$K = c + K_H = \{c + x \mid Ax = 0\}$$

Theorem 1.3: Invertible Matrix Theorem - Part 4

Let $A \in M_{n \times n}$ then the following are equivalent

- A is invertible.
- For some $b \in \mathbb{F}^n$ the equation $Ax = b$ has a unique solution.
- For all $b \in \mathbb{F}^n$ the equation $Ax = b$ has a unique solution.

Theorem 1.4: L

et $Ax = b$ be a system of linear equations. Then the system is consistent if and only if

$$\operatorname{rank}(A) = \operatorname{rank}(A \mid b)$$