

CH 2 — System of Linear Equations

Luke Lu • 2026-01-23



Info — Basic Terminology

1. An equation in n variables x_1, \dots, x_n that can be written in the form

$$a_1x_1 + \dots + a_nx_n = b$$

where a_1, \dots, a_n, b are constants is called a **linear equation**. The constants are called the **coefficients**, b is called the **constant term**

2. A set of m linear equations in the same variables x_1, \dots, x_n is called a **system of m linear equations in n variables**
3. A vector $\vec{s} = \begin{bmatrix} s_1 \\ \vdots \\ s_n \end{bmatrix}$ is called a **solution** of a system of m linear equations in n variables if all m equations are satisfied when we set $x_i = s_i \forall 1 \leq i \leq n$. The set of all solutions of a system of linear equations is called the **solution set** of the system.
4. If a system of linear equations has at least one solution, then it is said to be **consistent**. Otherwise, **inconsistent**



Info — Linear Solutions System

If the system of linear equations has two distinct solutions $\vec{s} = \begin{bmatrix} s_1 \\ \vdots \\ s_n \end{bmatrix}, \vec{t} = \begin{bmatrix} t_1 \\ \vdots \\ t_n \end{bmatrix}$, then for every $c \in \mathbb{R}$, $\vec{s} + c(\vec{s} - \vec{t})$ is a solution, and furthermore these solutions are all distinct.

Solving Systems of Linear Equations