

# Mathematics 1 - Linear Equations and Matrices

Topics : [Computer engineering](#)

Written on [March 13, 2024](#)

## 1. Linear Equations:

Linear equations are algebraic equations where each term is either a constant or a constant multiplied by a single variable raised to the power of 1. The general form of a linear equation in one variable  $x$  is:  $ax + b = 0$  where  $a$  and  $b$  are constants, and  $x$  is the variable.

For linear equations in multiple variables, they can be represented in the form of:  $a_1x_1 + a_2x_2 + \dots + a_nx_n = b$  where  $x_1, x_2, \dots, x_n$  are the variables, and  $a_1, a_2, \dots, a_n$  and  $b$  are constants.

Linear equations can be solved using various methods such as substitution, elimination, or using matrices and matrix operations.

## 2. Matrices:

A matrix is a rectangular array of numbers arranged in rows and columns. Each number in the matrix is called an element. Matrices are widely used to represent and solve systems of linear equations, perform transformations in computer graphics, and in various other applications.

For example, consider the following matrix:  $A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$  This is a  $3 \times 3$  matrix, meaning it has 3 rows and 3 columns.

Matrices can be added, subtracted, multiplied by scalars, and multiplied together using specific rules. For example, matrix addition and scalar multiplication are performed element-wise, while matrix multiplication involves multiplying rows of the first matrix with columns of the second matrix.

Additionally, matrices can be used to solve systems of linear equations using methods like Gaussian elimination or matrix inversion.

In the context of linear equations, matrices are often used to represent coefficients and constants. For example, the system of linear equations:  $2x + 3y = 5$   $4x - 2y = 6$  can be represented in matrix form as:  $\begin{bmatrix} 2 & 3 \\ 4 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 6 \end{bmatrix}$  where the left matrix represents the coefficients, the middle column vector represents the variables, and the right column vector represents the constants.

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