Linear Equation

- A **linear equation** in the variables $x_1, \cdots, x_n$ is an equation that can be written in the form

$$a_1 x_1 + a_2 x_2 + \cdots + a_n x_n = b,$$

where b and the coefficients $a_1, \cdots, a_n$ are real or complex numbers that are usually known in advance.

- The above equation can be written as

$$\mathbf{a}^T \mathbf{x} = b$$

where $\mathbf{a} = \begin{bmatrix} a_1 \\ a_2 \\ \vdots \\ a_n \end{bmatrix}$ and $\mathbf{x} = \begin{bmatrix} x_1 \\ x_2 \\ \vdots \\ x_n \end{bmatrix}$.