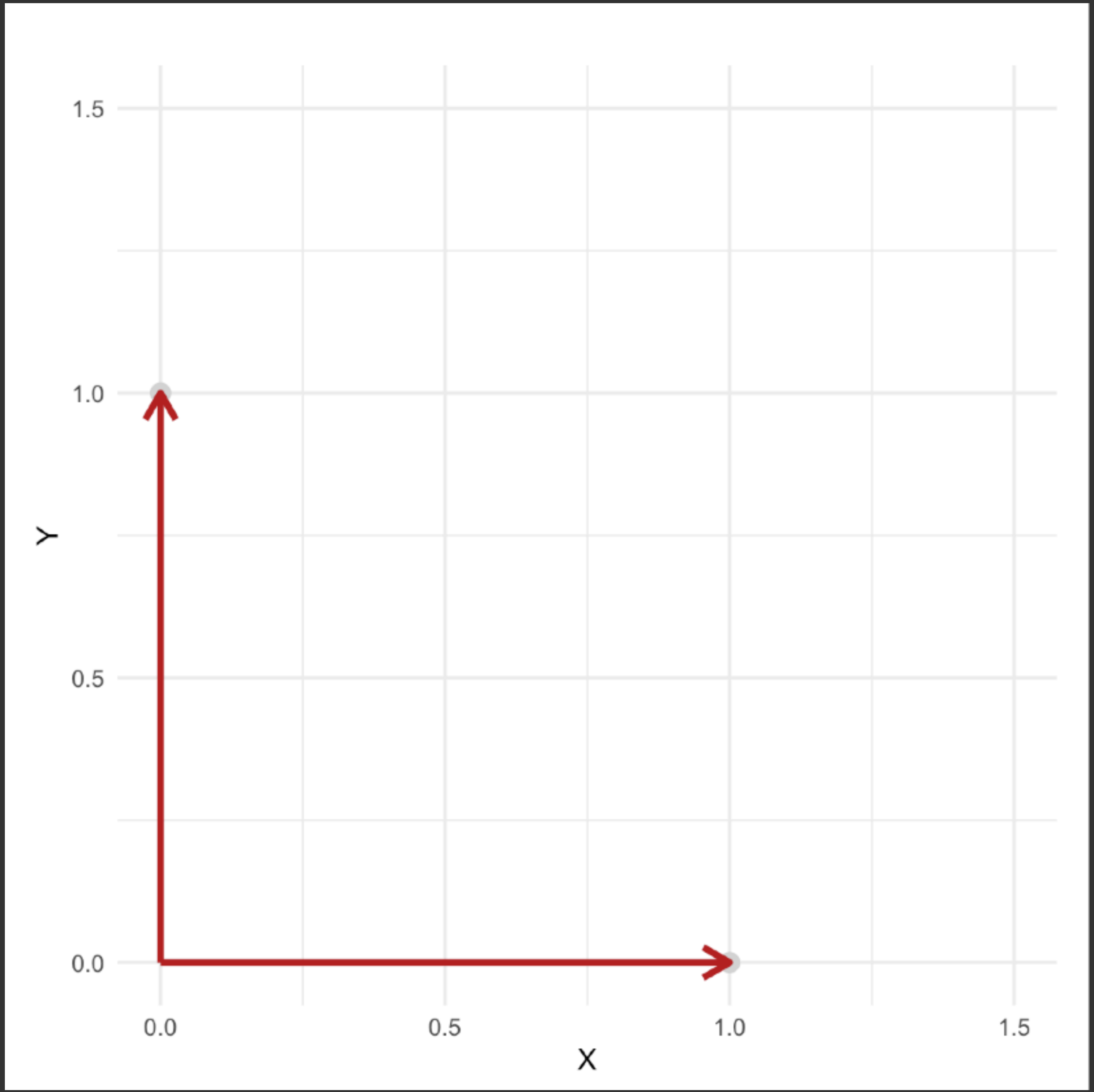
let's recap some important definitions

- A set of vectors $\in \mathbb{R}^n$ is called a **basis**, if they are **linearly independent** and every vector $\in \mathbb{R}^n$ can be expressed as a linear combination of these vectors.

- A set of n vectors $\overrightarrow{v_1}, \overrightarrow{v_2}, \ldots, \overrightarrow{v_n}$ is linearly independent if no vector in the set can be expressed as a linear combination of the remaining $n-1$ vectors. In other words, the only solution to $c_1\overrightarrow{v_1} + c_2\overrightarrow{v_2} + \cdots + c_n\overrightarrow{v_n} = 0$ is $c_1 = c_2 = \ldots = c_n = 0$ (where c_i are scalars)

- In other words, the coefficients $c_1, c_2, \ldots, c_n$ must all be zero for the linear combination to result in the zero vector and properly characterizing linear independence.

example



- Consider space $\mathbb{R}^2$
- Consider vectors $\vec{x} = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$ and $\vec{y} = \begin{bmatrix} 0 \\ 1 \end{bmatrix}$