

## N-DIMENSIONAL LINES

## **Definition**

Given two points  $x, y \in \mathbb{R}^n$ , the *line* through x and y is the set of points which can be expressed as the sum of x and  $\alpha(y-x)$  where  $\alpha \in \mathbb{R}$ .

In other words, the line through x and y is

$$\{z \in \mathbf{R}^n \mid \exists \alpha \in \mathbf{R}, z = x + \alpha(y - x)\}.$$

If there exists  $\alpha \in \mathbb{R}^n$  such  $z \in \mathbb{R}^n$  satisfies

$$z = x + \alpha(y - x),$$

then  $z = (1 - \alpha)x + \alpha y$ .

## Notation

We denote the line through x and y by L(x, y).

