

## N-DIMENSIONAL LINES

## Definition

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

In other words, the line through x and y is

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

Notice that if  $z = x + \alpha(x - y)$ , then

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

where  $\alpha \in \mathbf{R}$  and  $x, y \in \mathbf{R}^n$ .

## **Notation**

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

