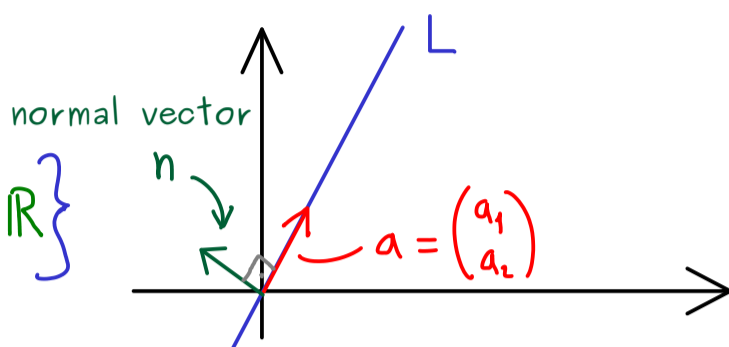


# Linear Algebra - Part 4

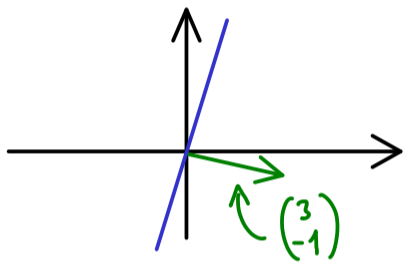
1st case: origin on the line  $L$

$$L = \left\{ v \in \mathbb{R}^2 \mid v = \lambda \cdot a \text{ for } \lambda \in \mathbb{R} \right\}$$

$$= \left\{ v \in \mathbb{R}^2 \mid \langle n, v \rangle = 0 \right\}$$



Example:



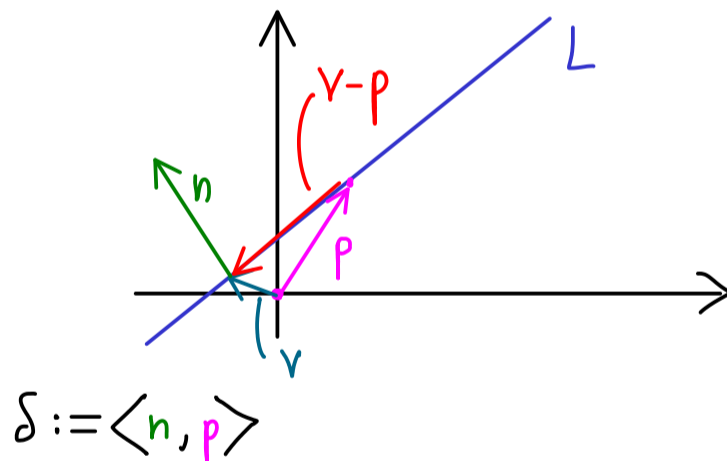
$$L = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid \left\langle \begin{pmatrix} 3 \\ -1 \end{pmatrix}, \begin{pmatrix} x \\ y \end{pmatrix} \right\rangle = 0 \right\}$$

$$= \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid y = 3x \right\}$$

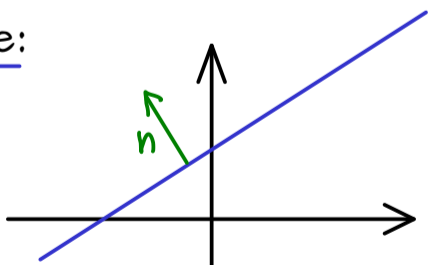
2nd case: origin not on line  $L$

$$L = \left\{ v \in \mathbb{R}^2 \mid \langle n, v - p \rangle = 0 \right\}$$

$$= \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid n_1 x + n_2 y = \delta \right\}$$



Example:



$$L = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \mid y = 2x + 5 \right\}$$

$$-2x + y = 5$$

$$n = \begin{pmatrix} -2 \\ 1 \end{pmatrix}$$

$$\delta = 5$$