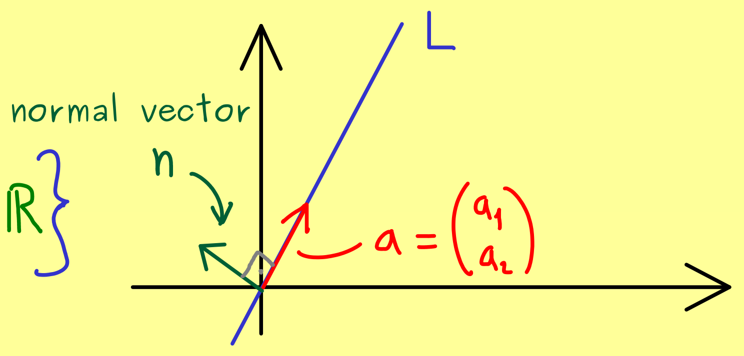
Linear Algebra – Part 4

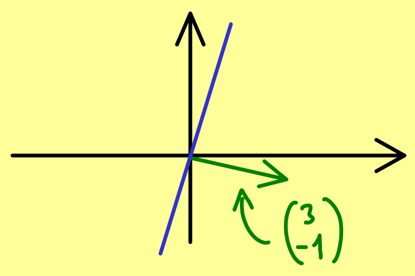
1st case: origin on the line L

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

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



Example:



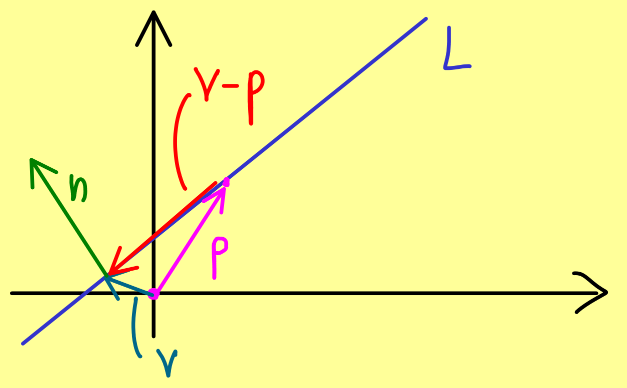
$$L = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \;\middle|\; \left\langle \begin{pmatrix} 3 \\ -1 \end{pmatrix}, \begin{pmatrix} x \\ y \end{pmatrix} \right\rangle = 0 \right\}$$

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

2nd case: origin not on line L

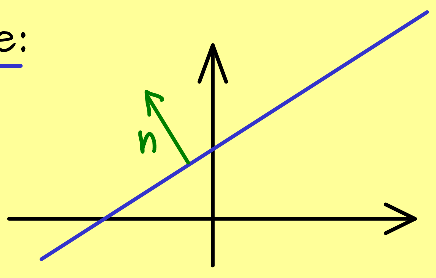
$$L = \{ v \in \mathbb{R}^2 \mid \langle n, v - p \rangle = 0 \}$$

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



$$\delta := \langle n, p \rangle$$

Example:



$$L = \left\{ \begin{pmatrix} x \\ y \end{pmatrix} \in \mathbb{R}^2 \;\middle|\; \underbrace{y = 2x + 5}_{-2x + y = 5} \right\}$$

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

$$\delta = 5$$