$\lambda > 0, \lambda < 0, \lambda = 0$

$$A x = \lambda x$$

A_n

$$A^2 x = \lambda^2 x, \quad A^n x = \lambda^{100} x$$

n valorespropios

$$A x - \lambda I x = 0$$

$$(A - \lambda I) x = 0$$

$$\det(A - \lambda I) = 0$$

$$\dot{x}_1 = a x_1 + b x_2$$
$$\dot{x}_2 = c x_1 + d x_2$$

$$\dot{\vec{x}} = \underset{n \times n}{A} \vec{x}$$

$$\dot{x}_1 = a x_1 \; \ldots\ldots$$
$$\dot{x}_2 = \ldots\ldots + d x_2$$

$$x_1 = x_1^0 e^{at}$$
$$x_2 = x_2^0 e^{dt}$$

$$\begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \end{pmatrix} = \begin{pmatrix} a & 0 \\ 0 & d \end{pmatrix} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$$

$$A = P \Lambda P^{-1}$$
$$\begin{pmatrix} \dot{x}_1 \\ \dot{x}_2 \end{pmatrix} = P \Lambda \underbrace{P^{-1} \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}}_{\begin{pmatrix} z_1 \\ z_2 \end{pmatrix}}$$

$$\begin{pmatrix} \dot{z}_1 \\ \dot{z}_2 \end{pmatrix} = \begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix} \begin{pmatrix} z_1 \\ z_2 \end{pmatrix}$$
$$z_1 = z_0 e^{\lambda_1 t}$$
$$z_2 = z_0 e^{\lambda_2 t}$$

EIGENVECTORS, EIGENVALUES = ... (A)

$$\begin{pmatrix} V_1 & V_2 \end{pmatrix}$$

P = EIGENVECTORS

$$[\lambda_1 , \lambda_2]$$

$$\begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix}$$

$$\underset{K \times m}{B} \; \underset{m * Z}{A} = \underset{K \times Z}{C}$$

$$\underset{m \times t}{A} \; \underset{K \times m}{B}$$

$\lambda_1, \lambda_2 \in \mathbb{R}, \lambda_1 \neq \lambda_2$

(1) $\begin{pmatrix} \dot{x} \\ \dot{y} \end{pmatrix} = A \begin{pmatrix} x \\ y \end{pmatrix}$ $\qquad A = P \Lambda P^{-1}$

$P^{-1}\begin{pmatrix} \dot{x} \\ \dot{y} \end{pmatrix} = P^{-1} P \Lambda \underbrace{P^{-1}\begin{pmatrix} x \\ y \end{pmatrix}}$

$P^{-1}\begin{pmatrix} \dot{x} \\ \dot{y} \end{pmatrix} = \begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix} P^{-1}\begin{pmatrix} x \\ y \end{pmatrix}$

$\begin{pmatrix} \dot{z} \\ \dot{w} \end{pmatrix} = \begin{pmatrix} \lambda_1 & 0 \\ 0 & \lambda_2 \end{pmatrix}\begin{pmatrix} z \\ w \end{pmatrix}$

$\begin{pmatrix} z \\ w \end{pmatrix} = P^{-1}\begin{pmatrix} x \\ y \end{pmatrix}$ $\qquad \begin{pmatrix} \dot{z} \\ \dot{w} \end{pmatrix} = P^{-1}\begin{pmatrix} \dot{x} \\ \dot{y} \end{pmatrix}$

$z = z_0 e^{\lambda_1 t}$

$w = w_0 e^{\lambda_2 t}$

$\begin{pmatrix} z \\ w \end{pmatrix} = \begin{pmatrix} z_0 e^{\lambda_1 t} \\ w_0 e^{\lambda_2 t} \end{pmatrix}$

$\begin{pmatrix} x \\ y \end{pmatrix} = P\begin{pmatrix} z \\ w \end{pmatrix}$

$$\begin{pmatrix} x \\ y \end{pmatrix} = P\begin{pmatrix} z \\ w \end{pmatrix} = \begin{pmatrix} V_1 & V_2 \end{pmatrix}\begin{pmatrix} z_0 e^{\lambda_1 t} \\ w_0 e^{\lambda_2 t} \end{pmatrix}$$

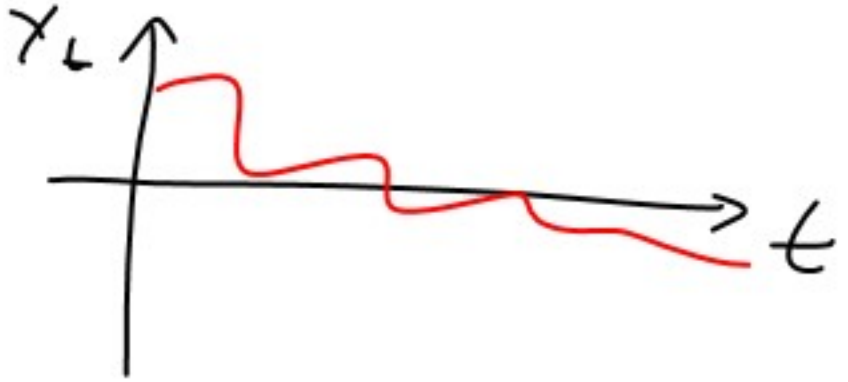
$$\begin{pmatrix} \dot{x} \\ \dot{y} \end{pmatrix} = A\begin{pmatrix} x \\ y \end{pmatrix}$$

$$\begin{pmatrix} x \\ y \end{pmatrix} = z_0 e^{\lambda_1 t} V_1 + w_0 e^{\lambda_2 t} V_2$$

(2)

$$\begin{pmatrix} \dot{x} \\ \dot{y} \end{pmatrix} = z_0 \lambda_1 e^{\lambda_1 t} V_1 + w_0 \lambda_2 e^{\lambda_2 t} V_2 = z_0 e^{\lambda_1 t} \lambda_1 V_1 + w_0 e^{\lambda_2 t} \lambda_2 V_2$$

$$A\begin{pmatrix} x \\ y \end{pmatrix} = A\left[z_0 e^{\lambda_1 t} V_1 + w_0 e^{\lambda_2 t} V_2\right] = z_0 e^{\lambda_1 t} A V_1 + w_0 e^{\lambda_2 t} A V_2$$



$$\begin{pmatrix}\dot{x}\\ \dot{y}\end{pmatrix} = A\begin{pmatrix}x\\ y\end{pmatrix}$$

$$\begin{pmatrix}x_0\\ y_0\end{pmatrix}$$

$$\begin{pmatrix}x_t\\ y_t\end{pmatrix} = z_0 e^{\lambda_1 t} v_1 + w_0 e^{\lambda_2 t} v_2$$

Si $t=0$

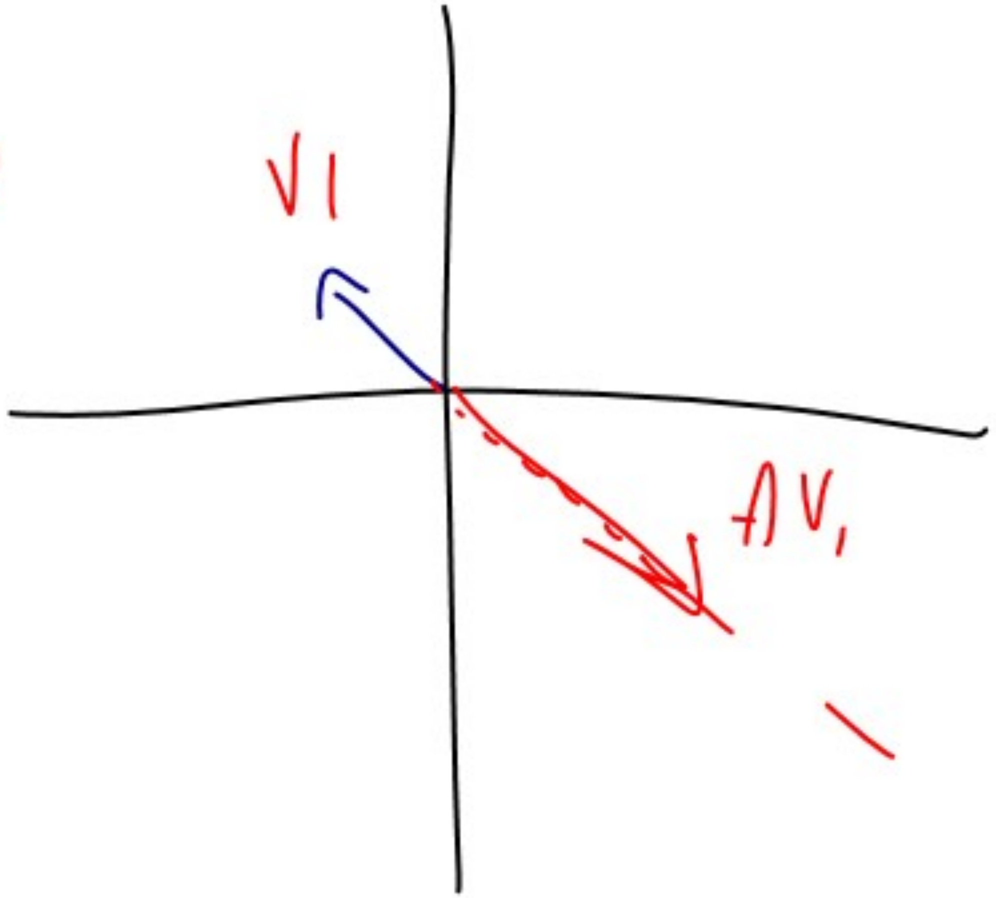
$$\begin{pmatrix}x_0\\ y_0\end{pmatrix} = z_0 e^{\lambda_1 \cdot 0} v_1 + w_0 e^{\lambda_2 \cdot 0} v_2$$

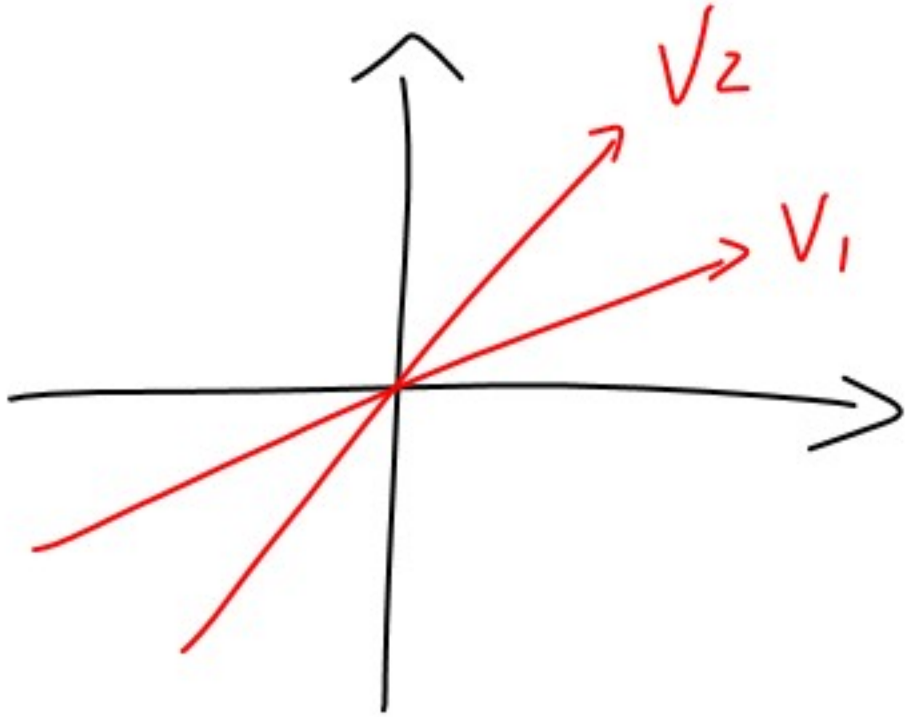
$$\boxed{\begin{pmatrix}z_0\\ w_0\end{pmatrix} = P^{-1}\begin{pmatrix}x_0\\ y_0\end{pmatrix}}$$

$$\begin{pmatrix}x_0\\ y_0\end{pmatrix} = z_0 v_1 + w_0 v_2 = \overbrace{\begin{pmatrix}v_1 & v_2\end{pmatrix}}^{P}\begin{pmatrix}z_0\\ w_0\end{pmatrix}$$

$$Av_1 = \lambda_1 v_1$$

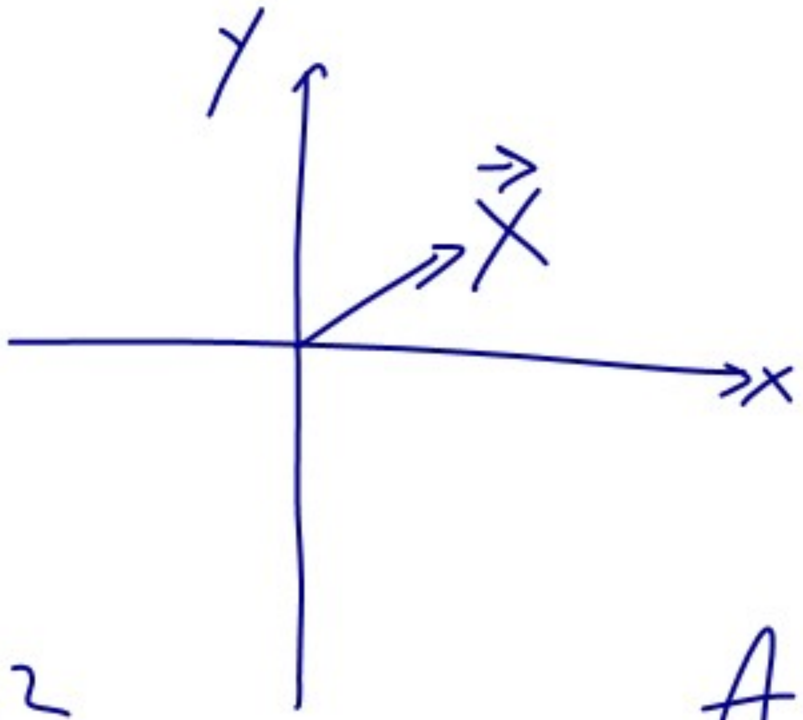
$$v_1 \neq 0$$

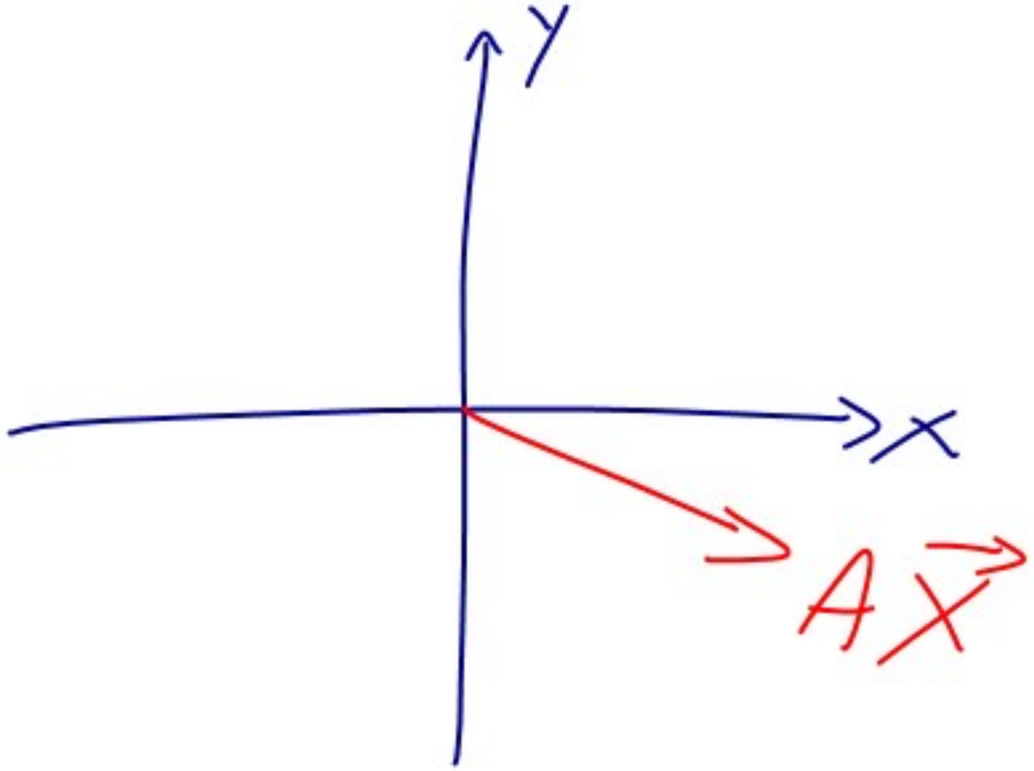




$$\left\{ \begin{pmatrix} 1 \\ 0 \end{pmatrix}, \begin{pmatrix} 0 \\ 1 \end{pmatrix} \right\}$$ BASE CANÓNICA

$$\{ V_1, V_2 \}$$ BASE VECTORES PROPIOS

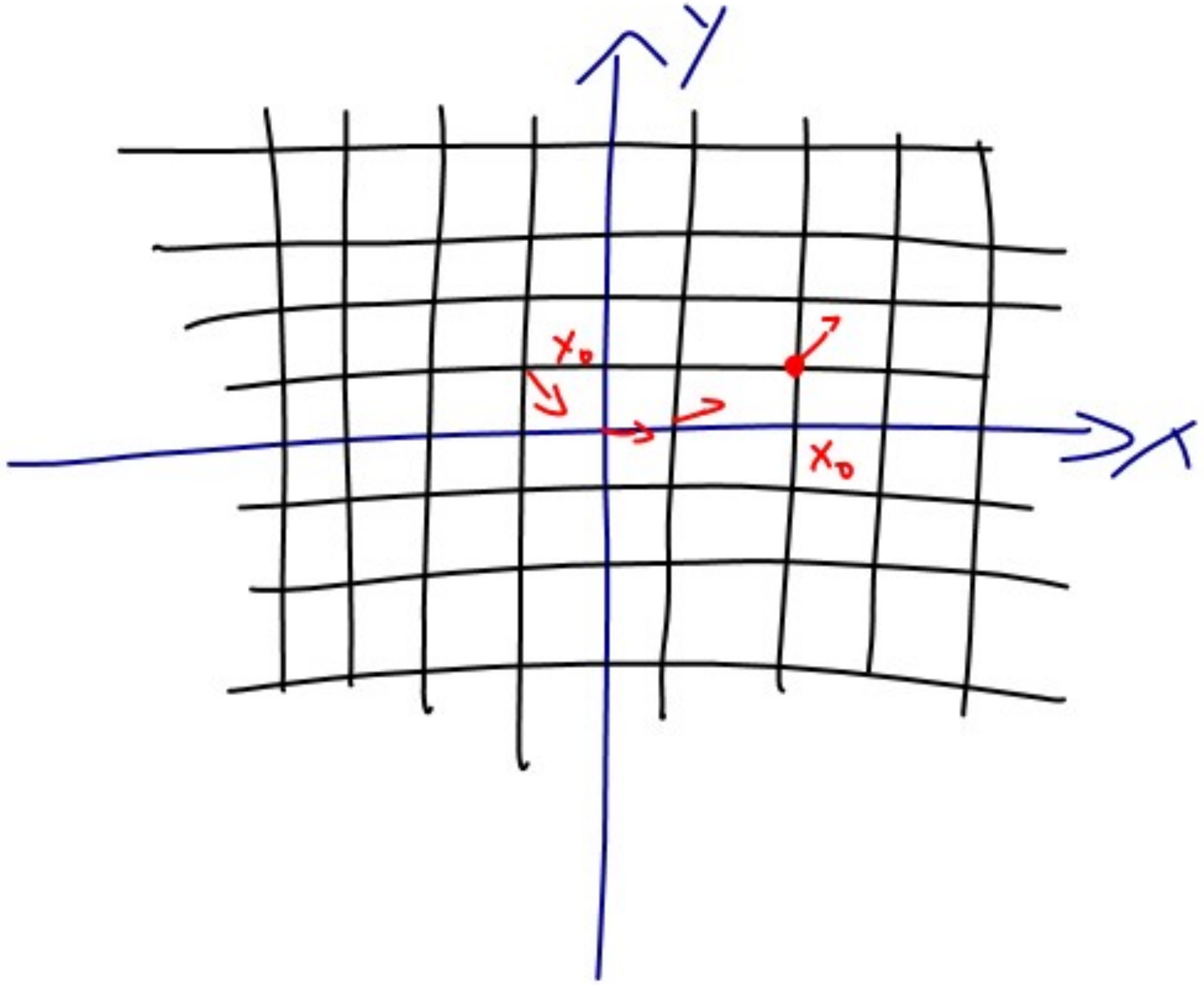




$$A\vec{v} = \lambda \vec{v}$$

$A : \mathbb{R}^2 \to \mathbb{R}^2$

$\vec{x} \to A\vec{x}$

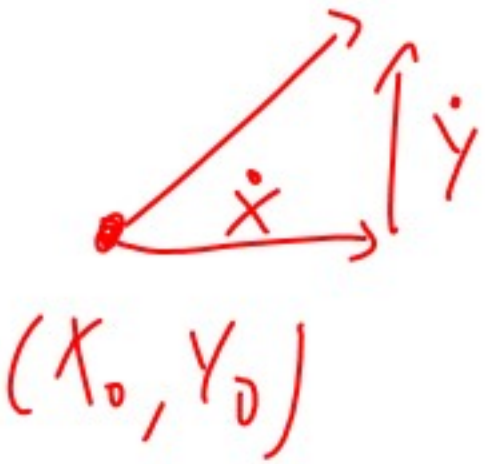


$$\dot{x} = ax + by$$

$$\dot{y} = cx + dy$$

$$\dot{x}(x_0, y_0) = ax_0 + by_0$$

$$\dot{y}(x_0, y_0) = cx_0 + dy_0$$



$$(\dot{x}, \dot{y})$$