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

$$\boxed{(A - \lambda I) Q_1 = 0}$$

$$A = (Q_1 \;\; Q_2) \begin{pmatrix} \lambda & 1 \\ 0 & \lambda \end{pmatrix} (Q_1 \;\; Q_2)^{-1}$$

$$A (Q_1 \;\; Q_2) = (Q_1 \;\; Q_2) \begin{pmatrix} \lambda & 1 \\ 0 & \lambda \end{pmatrix}$$

$$(A Q_1 \;\; A Q_2) = (\lambda Q_1 \;\; Q_1 + \lambda Q_2)$$

$$A Q_1 = \lambda Q_1$$

$$A Q_2 = Q_1 + \lambda Q_2$$

$$(A - \lambda I) Q_2 = Q_1$$

$$(A - \lambda I)^2 Q_2 = (A - \lambda I) Q_1$$

$$\boxed{(A - \lambda I)^2 Q_2 = 0}$$

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

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

$$\begin{pmatrix} \dot{x} \\ \dot{y} \end{pmatrix} = \begin{pmatrix} Q_1 & Q_2 \end{pmatrix} \begin{pmatrix} \lambda & 1 \\ 0 & \lambda \end{pmatrix} \underline{\begin{pmatrix} Q_1 & Q_2 \end{pmatrix}^{-1} \begin{pmatrix} x \\ y \end{pmatrix}}$$

$$\begin{pmatrix} w \\ z \end{pmatrix} = \begin{pmatrix} Q_1 & Q_2 \end{pmatrix}^{-1} \begin{pmatrix} x \\ y \end{pmatrix}$$

$$\overbrace{\begin{pmatrix} Q_1 & Q_2 \end{pmatrix}^{-1} \begin{pmatrix} \dot{x} \\ \dot{y} \end{pmatrix}} = \overbrace{\begin{pmatrix} Q_1 & Q_2 \end{pmatrix}^{-1} \begin{pmatrix} Q_1 & Q_2 \end{pmatrix}}^{I} \begin{pmatrix} \lambda & 1 \\ 0 & \lambda \end{pmatrix} \begin{pmatrix} Q_1 & Q_2 \end{pmatrix}^{-1} \begin{pmatrix} x \\ y \end{pmatrix}$$

$$\begin{pmatrix} \dot{w} \\ \dot{z} \end{pmatrix} = \begin{pmatrix} \lambda & 1 \\ 0 & \lambda \end{pmatrix} \begin{pmatrix} w \\ z \end{pmatrix}$$

$$\begin{pmatrix}\dot{w}\\ \dot{z}\end{pmatrix}=\begin{pmatrix}\lambda & 1\\ 0 & \lambda\end{pmatrix}\begin{pmatrix}w\\ z\end{pmatrix}$$

$\dot{w} = \lambda w + z$

$\dot{z} = \lambda z \rightarrow z_t = z_0 e^{\lambda t}$

$$\boxed{\dot{w} = \lambda w + z_0 e^{\lambda t}}$$

$$\boxed{\dot{y} + P(t)y = Q(t)}$$

① $\dot{w} - \lambda w = z_0 e^{\lambda t}$

$w_t = \alpha_t \beta_t$

↳ SOLUCIÓN DE LA HOMOGÉNEA

$$\boxed{\dot{\alpha}_t - \lambda \alpha_t = 0}$$

$\alpha_t = \alpha_0 e^{\lambda t}$

$\dot{w} = \dot{\alpha}\beta + \dot{\beta}\alpha$

$\dot{\alpha}\beta + \dot{\beta}\alpha - \lambda\alpha\beta = z_0 e^{\lambda t}$

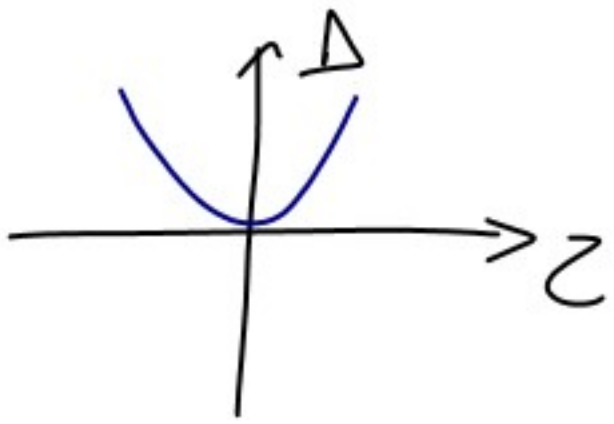
$\beta(\underbrace{\dot{\alpha} - \lambda\alpha}_{=0}) + \dot{\beta}\alpha = z_0 e^{\lambda t}$

$\dot{\beta}\alpha = z_0 e^{\lambda t}$

$\dot{\beta}\,\alpha_0 \cancel{e^{\lambda t}} = z_0 \cancel{e^{\lambda t}}$

$\dot{\beta} = \frac{z_0}{\alpha_0}$

$$\dot{\beta} = \frac{z_0}{\alpha_0}$$



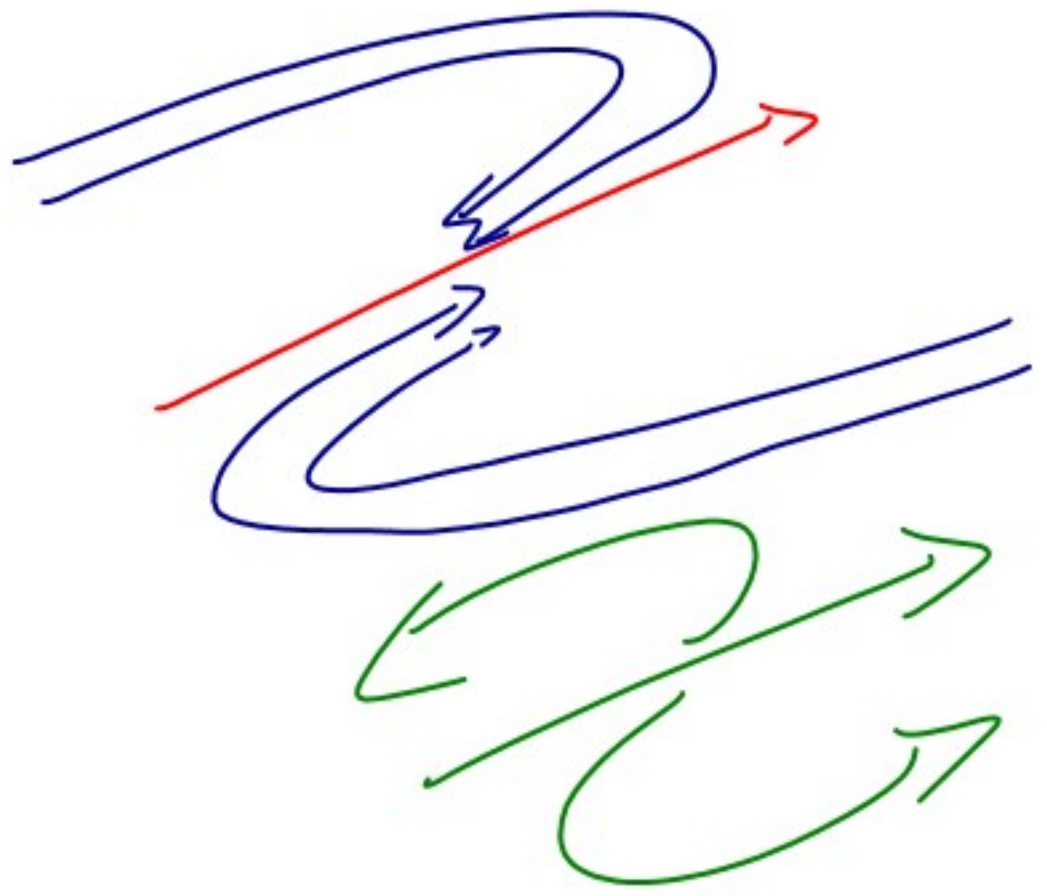
$$\int d\beta = \int \frac{z_0}{\alpha_0} dt + C$$

$$\beta_t = \frac{z_0}{\alpha_0} t + C$$

$$w_t = \alpha_t \beta_t = \alpha_0 e^{\lambda t}\left(\frac{z_0 t}{\alpha_0} + C\right)$$

$$w_t = e^{\lambda t}(t + \hat{C})$$

$$\begin{pmatrix} w_t \\ z_t \end{pmatrix} = \begin{pmatrix} t + \hat{C} \\ z_0 \end{pmatrix} e^{\lambda t}$$



$$\begin{pmatrix}\dot{x}\\ \dot{y}\end{pmatrix} = \begin{pmatrix}a & b\\ c & d\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}$$

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

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

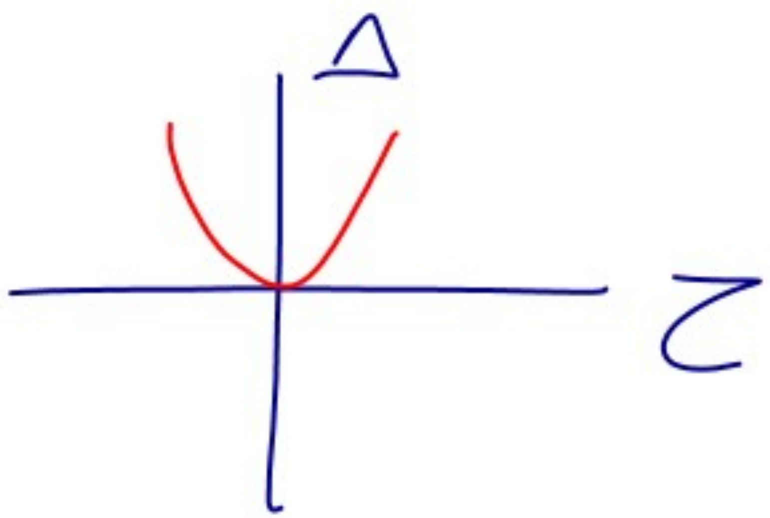
$$P^{-1}\begin{pmatrix}\dot{x}\\ \dot{y}\end{pmatrix} = P^{-1}P\begin{pmatrix}\lambda_1 & 0\\ 0 & \lambda_2\end{pmatrix}P^{-1}\begin{pmatrix}x\\ y\end{pmatrix}$$

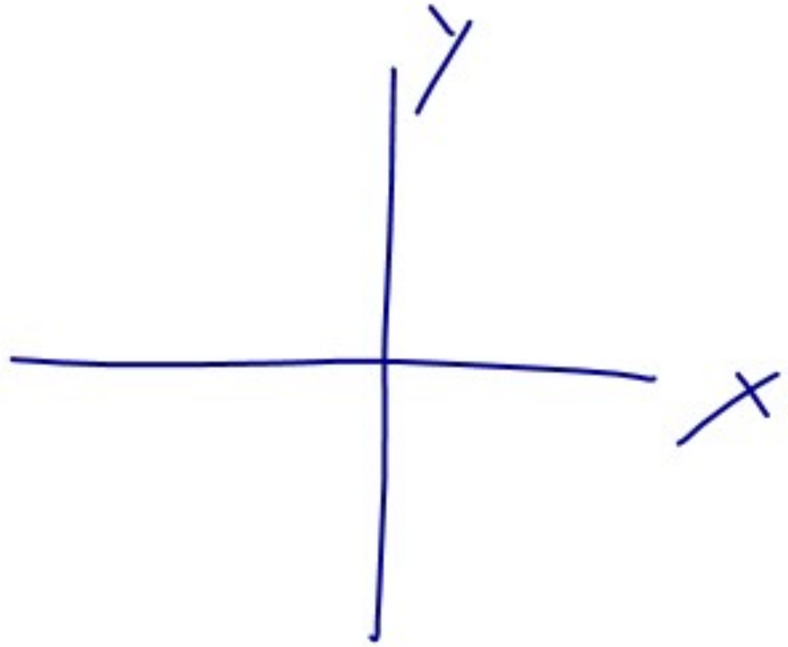
$$\begin{pmatrix}\dot{\alpha}\\ \dot{\beta}\end{pmatrix} = \begin{pmatrix}\lambda_1 & 0\\ 0 & \lambda_2\end{pmatrix}\begin{pmatrix}\alpha\\ \beta\end{pmatrix}$$

$\dot{\alpha} = \lambda_1 \alpha \qquad \alpha_t = \alpha_0 e^{\lambda_1 t}$

$\dot{\beta} = \lambda_2 \beta \qquad \beta_t = \beta_0 e^{\lambda_2 t}$

$$\begin{pmatrix}\alpha\\ \beta\end{pmatrix} = P^{-1}\begin{pmatrix}x\\ y\end{pmatrix}$$

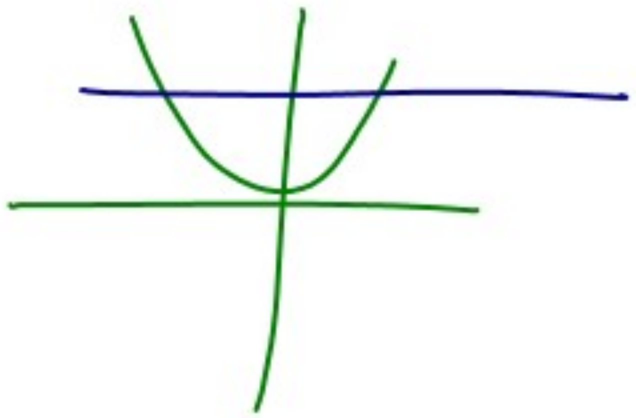




$$\Delta = \lambda_1 \lambda_2$$
$$\tau = \lambda_1 + \lambda_2$$

Δ

ζ



$$\begin{pmatrix} \Delta & \xi \\ 0 & 1 \end{pmatrix} \qquad \begin{pmatrix} 0 & -1 \\ \Delta & \zeta \end{pmatrix}$$

$$|AB| = |A||B|$$

$$|A^2| = |A||A| = |A|^2$$

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

$$|(A - \lambda I)^2| = 0$$