$$\dot{x} = f(x,y)$$
$$\dot{y} = g(x,y)$$

$\Downarrow$ (0,0)... EQUILIBRIUMSPOINT

$$\rightsquigarrow f(x,y) = f(0,0) + f_x(0,0)x + f_y(0,0)y + F(x,y)$$
$$= 0 + ax + by + F(x,y).$$

WHERE $(x,y) \approx (0,0)$ AND $F(x,y) = \mathcal{O}(|(x,y)|^2)$

$$g(x,y) = cx + dy + G(x,y)$$

WHERE $(x,y) \approx (0,0)$ $G(x,y) = \mathcal{O}(|(x,y)|^2)$.

$\Downarrow$ $\vec{x} = (x,y)$.

$$\dot{\vec{x}} = A\vec{x} + H(\vec{x})$$
$$\left(A = \begin{pmatrix} a & b \\ c & d \end{pmatrix},\ H(\vec{x}) = \begin{pmatrix} F(x,y) \\ G(x,y) \end{pmatrix} = \mathcal{O}(|\vec{x}|^2) \right)$$

$\Downarrow$ $A = PCP^{-1}$
P... INVERTIBLE.

$$\dot{\vec{x}} = PCP^{-1}\vec{x} + H(PP^{-1}\vec{x}).$$

$\Downarrow$ $\vec{z} = P^{-1}\vec{x}$.

$$\dot{\vec{z}} = C\vec{z} + \underbrace{P^{-1}H(P\vec{z})}_{\mathcal{O}(|\vec{z}|^2)}.$$