

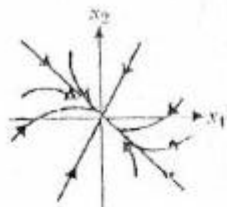
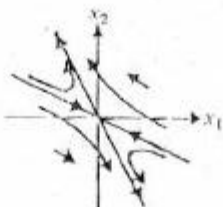
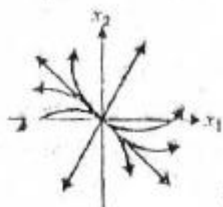
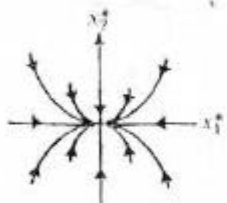
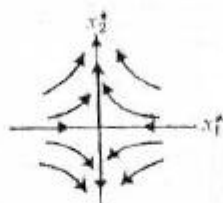
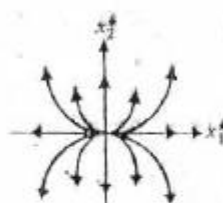
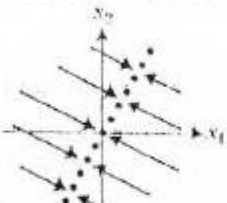
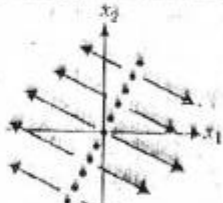
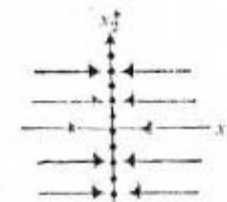
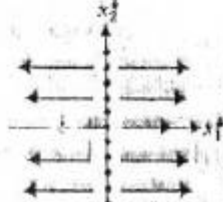
Retratos de Fase de un Sistema Libre de Segundo Orden

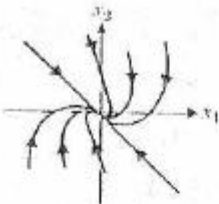
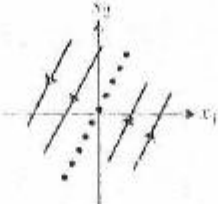
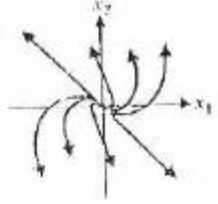
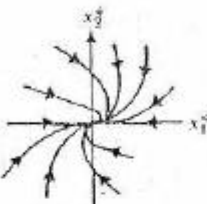
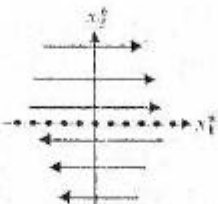
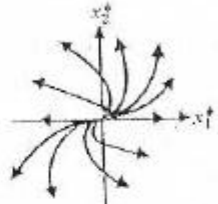
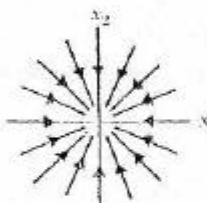
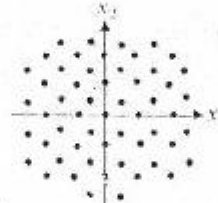
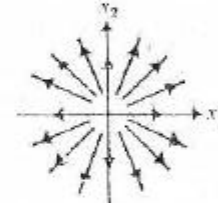
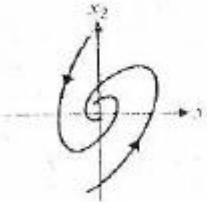
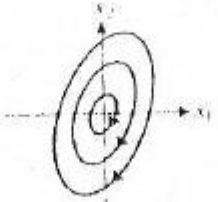
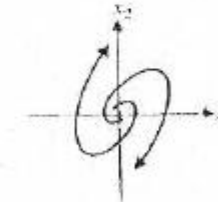
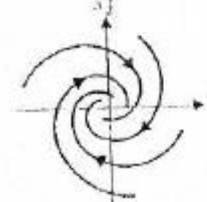
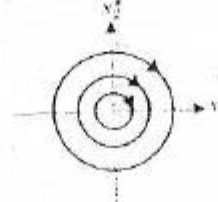
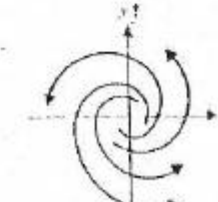
Código: Tab_RetFase

A-702 Control I

E-504 Dinámica de los Sistemas Físicos

Sea el sistema de la forma $\dot{x} = A \cdot x$, $A \in \mathbb{R}^{2 \times 2}$.

		Nodo estable $\lambda_1 < 0, \lambda_2 < 0$	Ensilladura $\lambda_1 < 0, \lambda_2 > 0$	Nodo inestable $\lambda_1 > 0, \lambda_2 > 0$
Autovalores reales, distintos y no nulos	Forma arbitraria	 $A = \begin{bmatrix} -2 & -1 \\ -2 & -3 \end{bmatrix} \quad \lambda_1 = -1, \lambda_2 = -4$	 $A = \begin{bmatrix} -3 & -2 \\ 2 & 2 \end{bmatrix} \quad \lambda_1 = -2, \lambda_2 = 1$	 $A = \begin{bmatrix} 2 & 1 \\ 2 & 3 \end{bmatrix} \quad \lambda_1 = 1, \lambda_2 = 4$
	Forma canónica	 $\Lambda = \begin{bmatrix} -1 & 0 \\ 0 & -4 \end{bmatrix}$	 $\Lambda = \begin{bmatrix} -2 & 0 \\ 0 & 1 \end{bmatrix}$	 $\Lambda = \begin{bmatrix} 1 & 0 \\ 0 & 4 \end{bmatrix}$
Autovalores reales, distintos; uno nulo		$\lambda_1 < 0, \lambda_2 = 0$		$\lambda_1 > 0, \lambda_2 = 0$
	Forma arbitraria	 $A = \begin{bmatrix} -4 & 2 \\ 2 & -1 \end{bmatrix} \quad \lambda_1 = -5, \lambda_2 = 0$		 $A = \begin{bmatrix} 4 & -2 \\ 2 & 1 \end{bmatrix} \quad \lambda_1 = 5, \lambda_2 = 0$
	Forma canónica	 $\Lambda = \begin{bmatrix} -5 & 0 \\ 0 & 0 \end{bmatrix}$		 $\Lambda = \begin{bmatrix} 5 & 0 \\ 0 & 0 \end{bmatrix}$

		$\lambda_1 = \lambda_2 < 0$	$\lambda_1 = \lambda_2 = 0$	$\lambda_1 = \lambda_2 > 0$
Autovalores iguales, acoplado	Forma arbitraria	 $A = \begin{bmatrix} 1 & 1 \\ 1 & -3 \end{bmatrix}, \lambda_1 = \lambda_2 = -2$	 $A = \begin{bmatrix} 2 & -1 \\ 4 & -2 \end{bmatrix}, \lambda_1 = \lambda_2 = 0$	 $A = \begin{bmatrix} 1 & -1 \\ 1 & 3 \end{bmatrix}, \lambda_1 = \lambda_2 = 2$
	Forma canónica de Jordan	 $J = \begin{bmatrix} -2 & 1 \\ 0 & -2 \end{bmatrix}$	 $J = \begin{bmatrix} 0 & 1 \\ 0 & 0 \end{bmatrix}$	 $J = \begin{bmatrix} 2 & 1 \\ 0 & 2 \end{bmatrix}$
Desacoplado		 $\Lambda = \begin{bmatrix} -2 & 0 \\ 0 & -2 \end{bmatrix}$ estrella estable	 $\Lambda = \begin{bmatrix} 0 & 0 \\ 0 & 0 \end{bmatrix}$	 $\Lambda = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$ estrella inestable
		Foco estable $\lambda_{1,2} = \alpha \pm j\omega, \alpha < 0$	Centro $\lambda_{1,2} = \alpha \pm j\omega, \alpha = 0$	Foco inestable $\lambda_{1,2} = \alpha \pm j\omega, \alpha > 0$
Autovalores complejos conjugados	Forma arbitraria	 $A = \begin{bmatrix} 2 & -3 \\ 6 & -4 \end{bmatrix}, \lambda_{1,2} = -1 \pm 3j$	 $A = \begin{bmatrix} -1 & 2 \\ -5 & 1 \end{bmatrix}, \lambda_{1,2} = \pm 3j$	 $A = \begin{bmatrix} -2 & 3 \\ -6 & 4 \end{bmatrix}, \lambda_{1,2} = 1 \pm 3j$
	Forma canónica	 $A^* = \begin{bmatrix} -1 & 3 \\ -3 & -1 \end{bmatrix}, \lambda_{1,2} = -1 \pm 3j$	 $A^* = \begin{bmatrix} 0 & 3 \\ -3 & 0 \end{bmatrix}, \lambda_{1,2} = \pm 3j$	 $A^* = \begin{bmatrix} 1 & -3 \\ 3 & 1 \end{bmatrix}, \lambda_{1,2} = 1 \pm 3j$