

NONLINEAR DIFFERENTIAL EQUATIONS AND STABILITY

(Chapter 9)

Phase Portraits for 2D Systems (Section 9.1)

$$\underline{x}' = A \underline{x}, \quad A = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$$

$$P_A(\lambda) = \det(A - \lambda I) = \lambda^2 - p \cdot \lambda + q$$

$$p = \text{tr}(A) = a_{11} + a_{22}$$

$$q = \det(A) = a_{11} \cdot a_{22} - a_{12} \cdot a_{21}$$

