

Problem 5

$$0 = x^4 y + y \rightarrow y = 0 \quad \text{or} \quad x = -1$$

$$0 = -y^2 + 3x - 3y + xy$$

$$y = 0 \rightarrow 0 = 3x \quad \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\cancel{y=0} \quad x = -1 \rightarrow 0 = -y^2 - 3 - 4y \quad \begin{bmatrix} -1 \\ -1 \end{bmatrix} \quad \begin{bmatrix} -1 \\ -3 \end{bmatrix}$$

$$DF = \begin{bmatrix} y & x+1 \\ 3+y & -2y-3+x \end{bmatrix}$$

$$\begin{bmatrix} 0 \\ 0 \end{bmatrix} \quad DF = \begin{bmatrix} 0 & 1 \\ 3 & -3 \end{bmatrix}$$

$$P = (-\lambda)(-3-\lambda) - 3 = \lambda^2 + 3\lambda - 3$$

unstable

$$\lambda = -3 \pm \sqrt{9 - 4(-3)}$$

$$\begin{bmatrix} -1 \\ -1 \end{bmatrix} \quad DF = \begin{bmatrix} -1 & 0 \\ 2 & -2 \end{bmatrix} \quad \text{stable}^2$$

$$\begin{bmatrix} -1 \\ -3 \end{bmatrix} \quad DF = \begin{bmatrix} -3 & 0 \\ 0 & 2 \end{bmatrix} \quad \text{unstable}$$