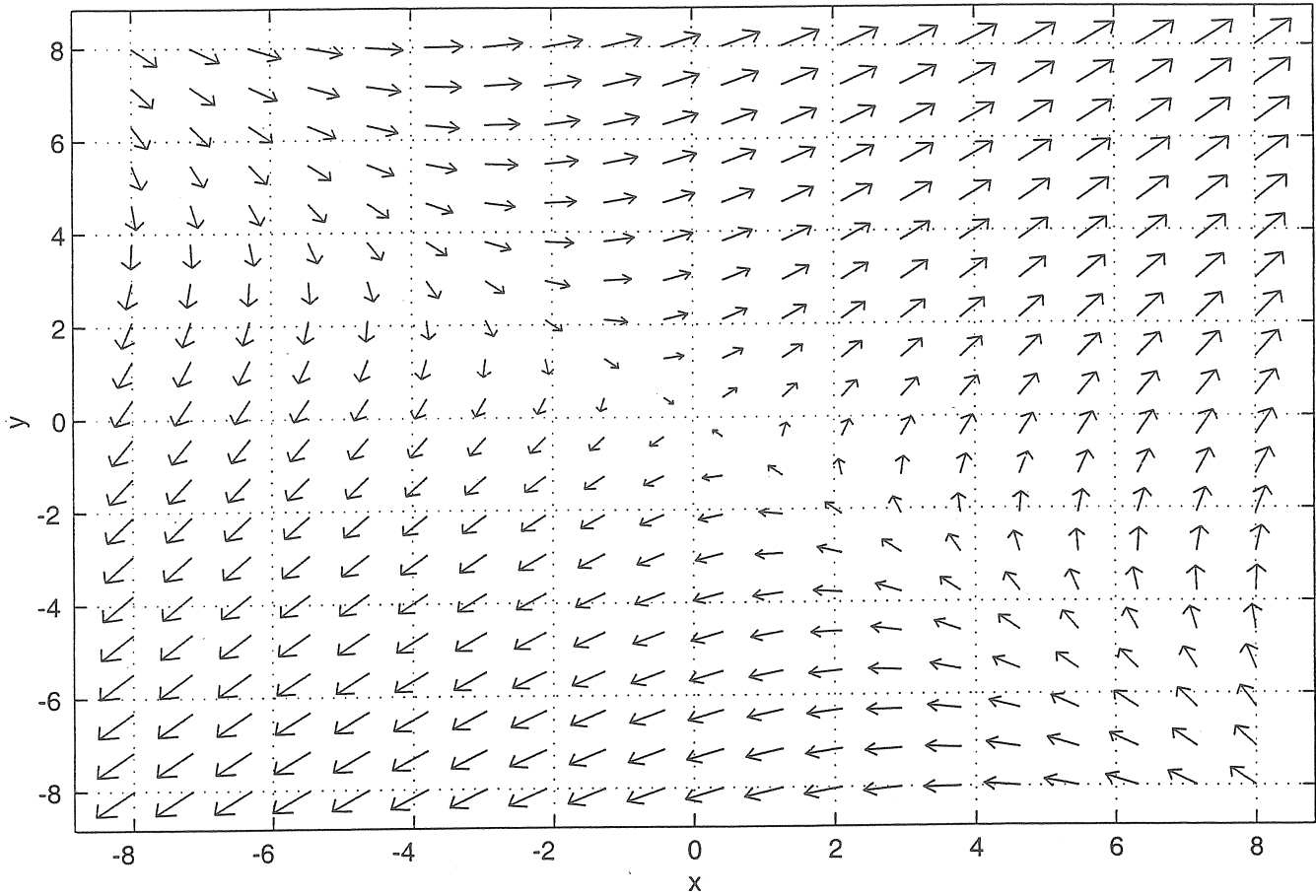
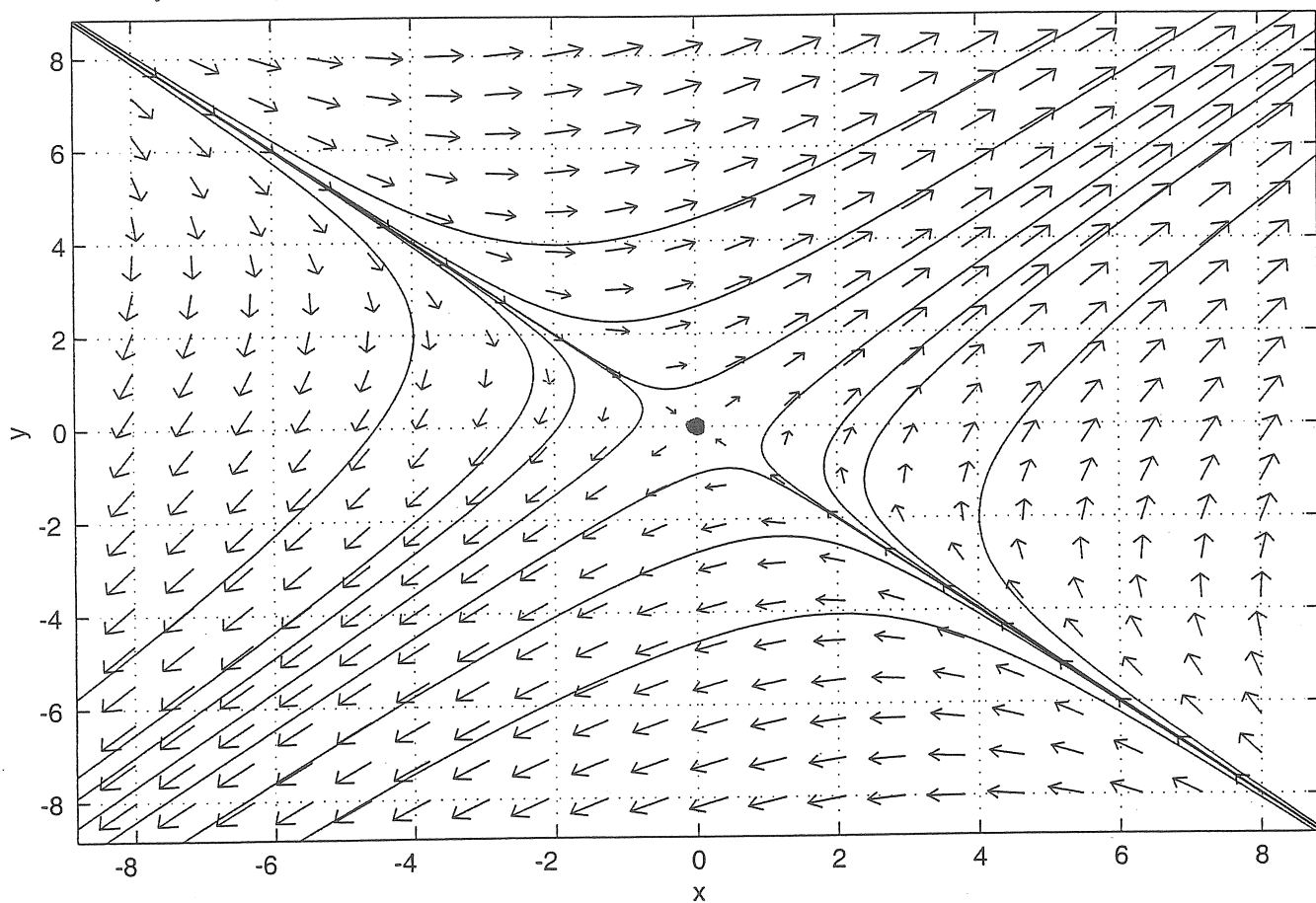


$$\begin{aligned}x' &= x + 2y \\ y' &= 2x + y\end{aligned}$$



DIRECTION FIELD FOR  $\vec{x}'(t) = \begin{bmatrix} 1 & 2 \\ 2 & 1 \end{bmatrix} \vec{x}(t)$

$$\begin{aligned}x' &= x + 2y \\ y' &= 2x + y\end{aligned}$$

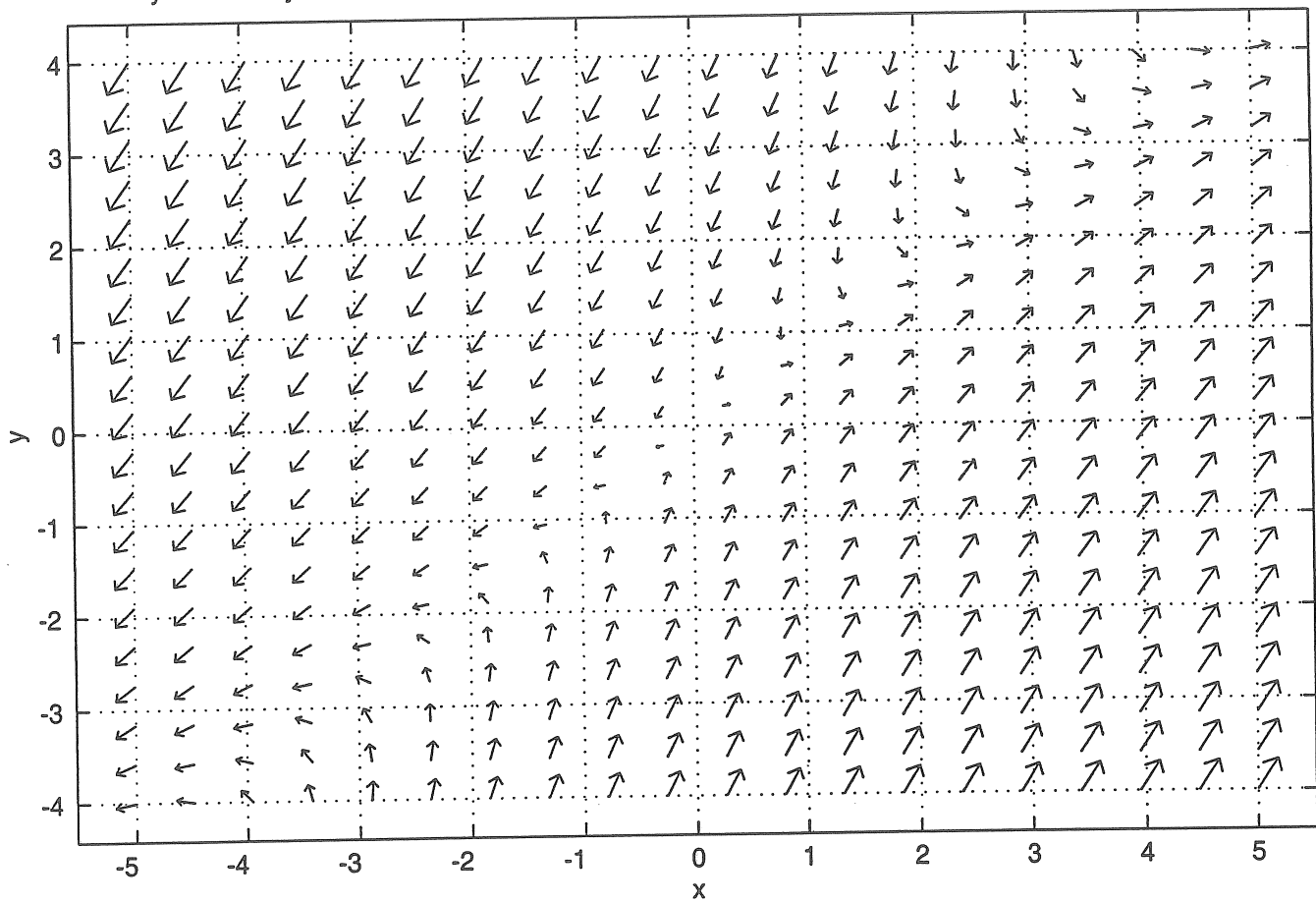


DIRECTION FIELD WITH SAMPLE TRAJECTORIES

$$\lambda = 3, \quad \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \text{SAMPLE EIGENVECTOR}$$

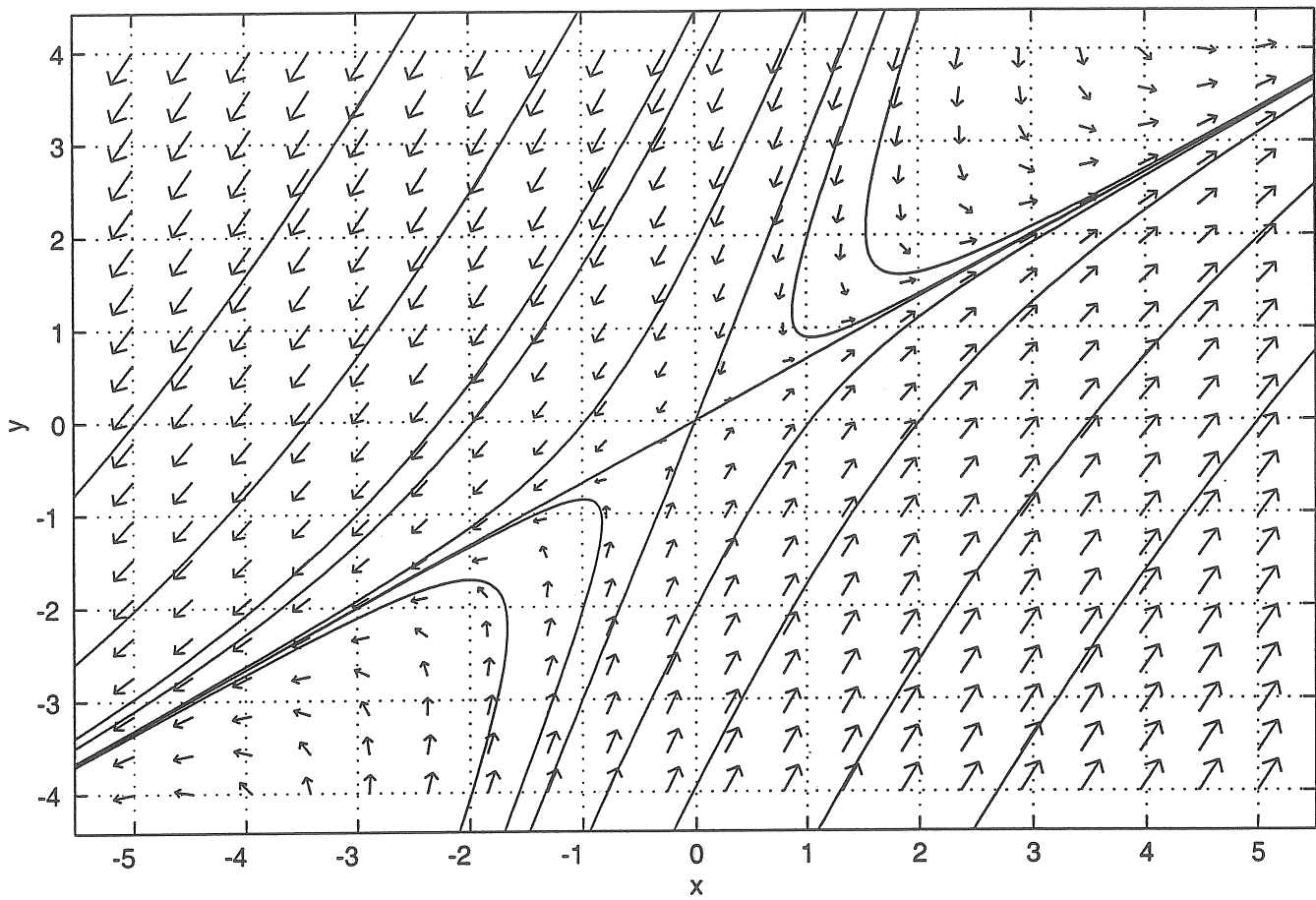
$$\lambda = -1, \quad \begin{bmatrix} 1 \\ -1 \end{bmatrix} = \text{SAMPLE EIGENVECTOR}$$

$$\begin{aligned}x' &= 4x - 3y \\ y' &= 6x - 7y\end{aligned}$$



DIRECTION FIELD FOR  $\vec{x}'(t) = \begin{bmatrix} 4 & -3 \\ 6 & -7 \end{bmatrix} \vec{x}(t)$

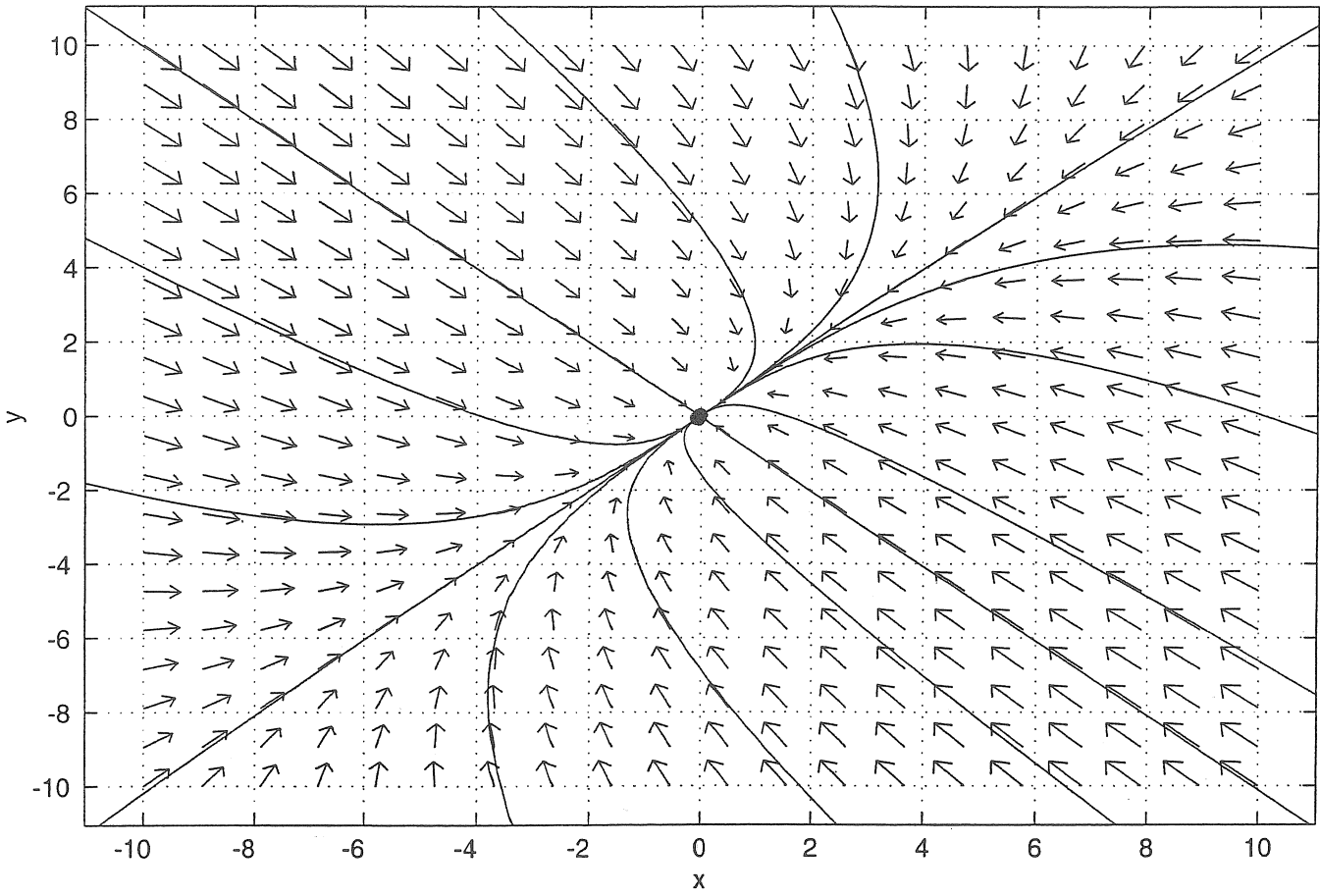
$$\begin{aligned}x' &= 4x - 3y \\ y' &= 6x - 7y\end{aligned}$$



$$\lambda = 2, \begin{bmatrix} 3 \\ 2 \end{bmatrix}$$

$$\lambda = -5, \begin{bmatrix} 1 \\ 3 \end{bmatrix}$$

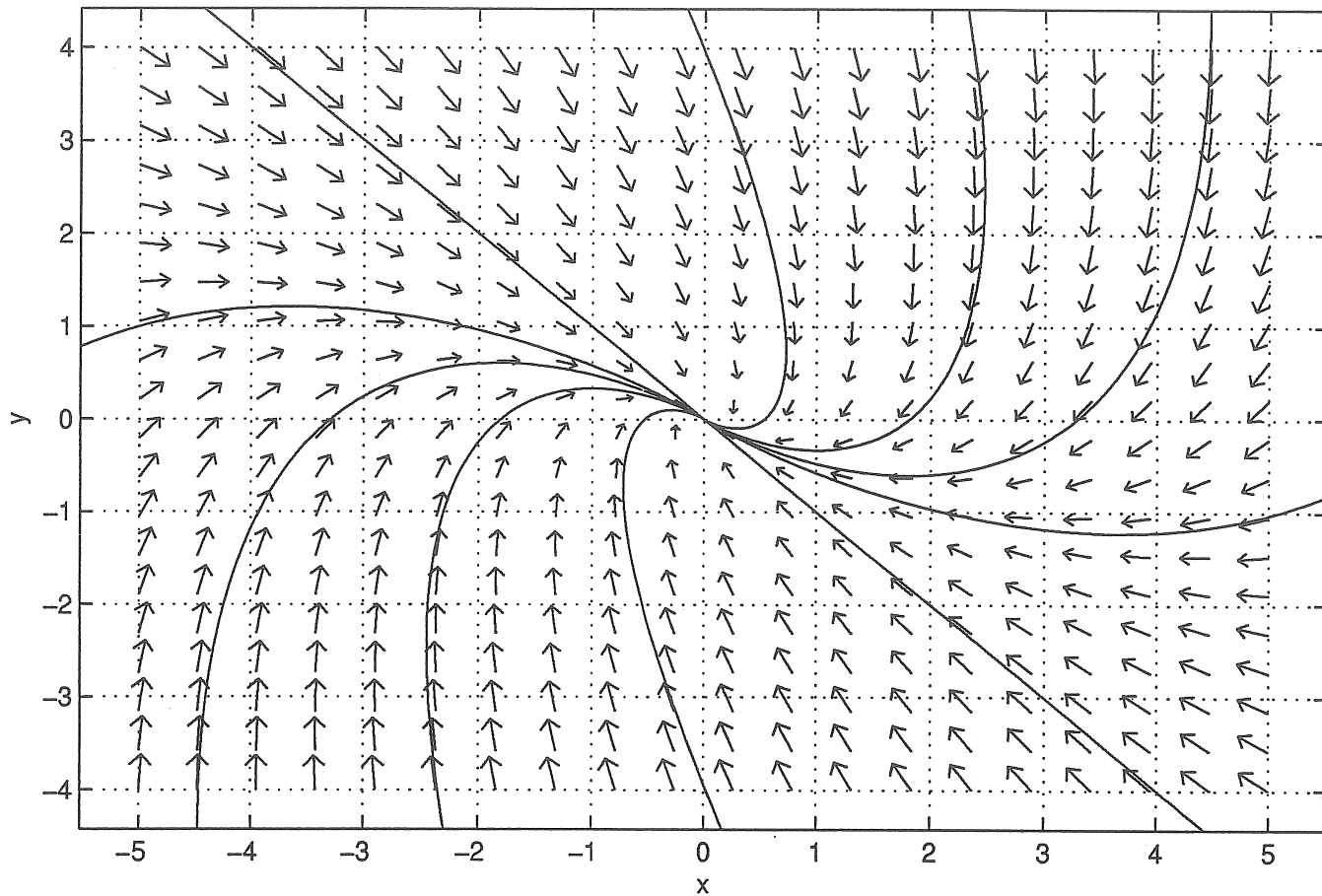
$$\begin{aligned}x' &= -2x + y \\ y' &= x - 2y\end{aligned}$$



$$\lambda = -1, \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

$$\lambda = -3, \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

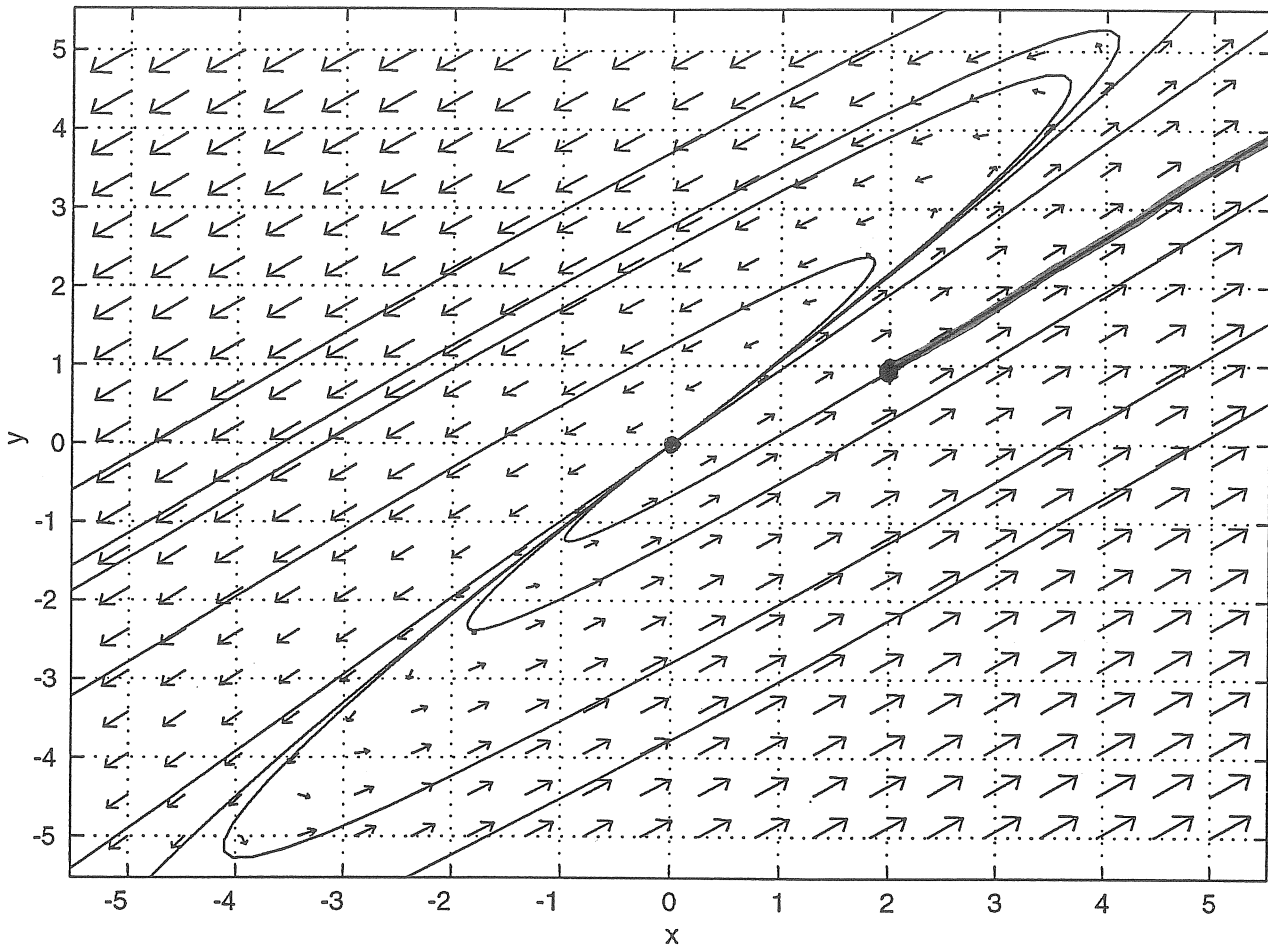
$$\begin{aligned}x' &= -x + y \\y' &= -x - 3y\end{aligned}$$



$$A = \begin{bmatrix} -1 & 1 \\ -1 & -3 \end{bmatrix} \quad \lambda = -2 \text{ (REPEATED)}$$

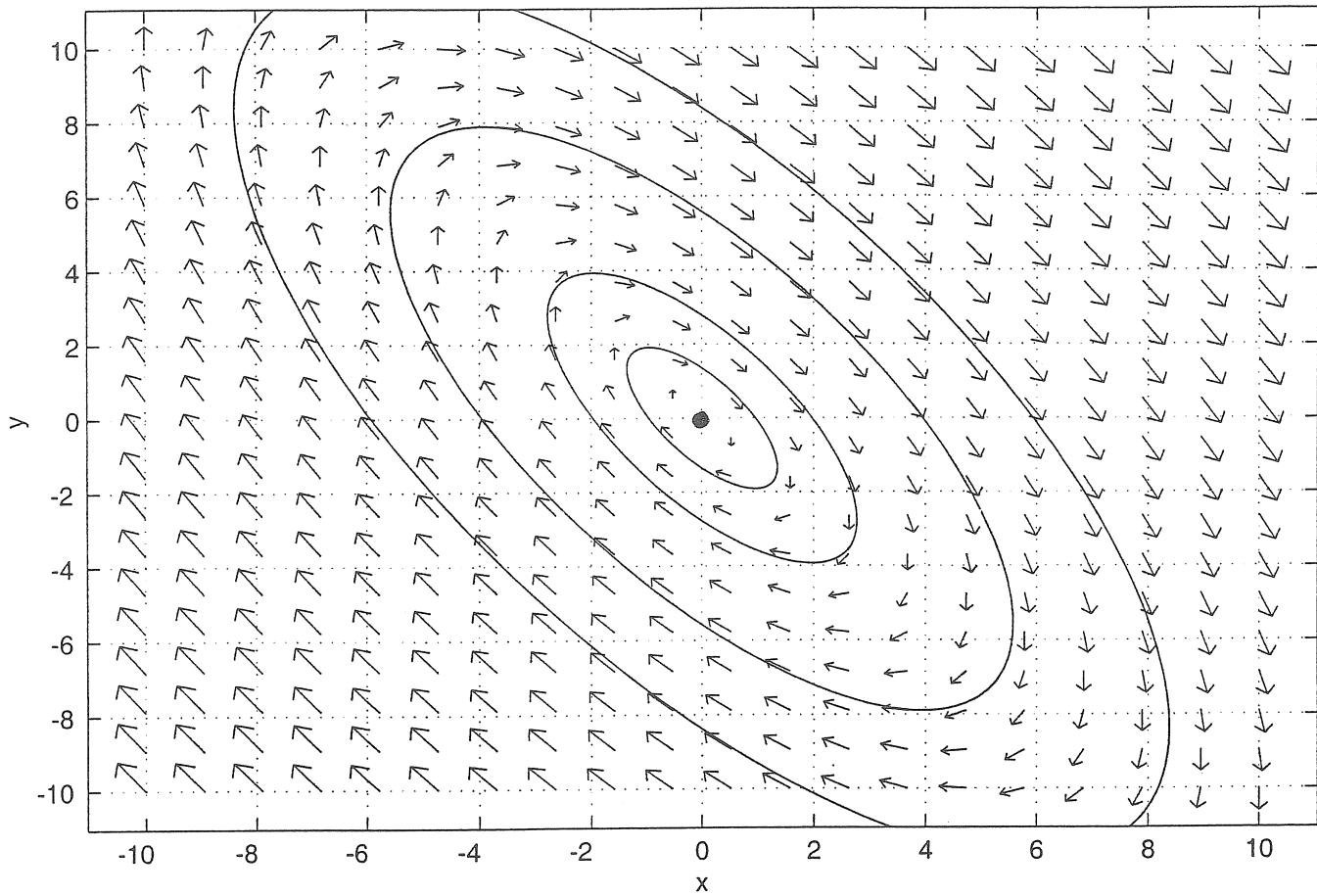
$$\text{SAMPLE EIGENVECTOR} = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$$

$$\underline{x}' = \begin{bmatrix} 5 & -4 \\ 4 & -3 \end{bmatrix} \underline{x}$$



$$\lambda = 1 \text{ (REPEATED), } \begin{bmatrix} 1 \\ 1 \end{bmatrix}$$

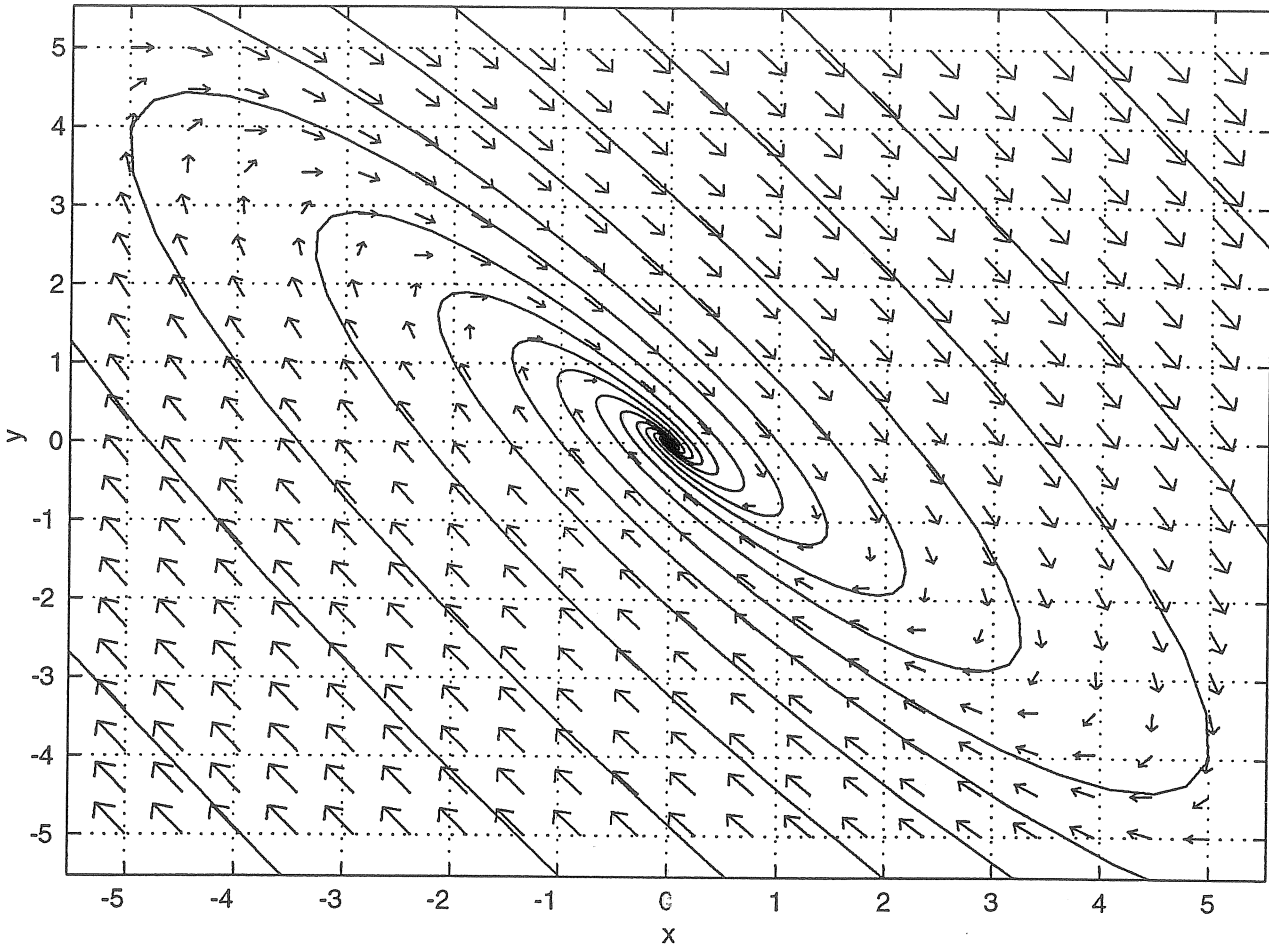
$$\begin{aligned}x' &= x+y \\ y' &= -2x-y\end{aligned}$$



$$\lambda = \pm i, \quad \begin{bmatrix} 1 \pm i \\ -2 \end{bmatrix}$$



$$\underline{x}' = \begin{bmatrix} 3 & 4 \\ -5 & -5 \end{bmatrix} \underline{x}$$



$$\lambda = -1 \pm 2i, \quad \begin{bmatrix} 4 \pm 2i \\ 5 \end{bmatrix}$$