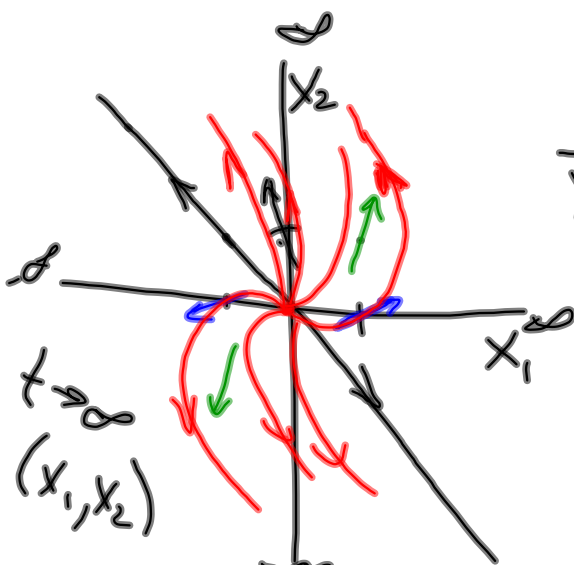


$$\vec{x}' = \begin{bmatrix} 2 & -1 \\ 1 & 4 \end{bmatrix} \vec{x}, \quad \lambda = 3, \quad \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

$$e^{3t}$$



$$\vec{x} = c_1 \begin{bmatrix} -1 \\ 1 \end{bmatrix} e^{3t} + c_2 \left[\begin{bmatrix} -1 \\ 1 \end{bmatrix} t + \begin{bmatrix} 0 \\ 1 \end{bmatrix} \right] e^{3t}$$

$$(A - \lambda I) \vec{p} = \vec{k}$$

$$\begin{bmatrix} -1 & -1 \\ 1 & 1 \end{bmatrix} \vec{p} = \begin{bmatrix} -1 \\ 1 \end{bmatrix}$$

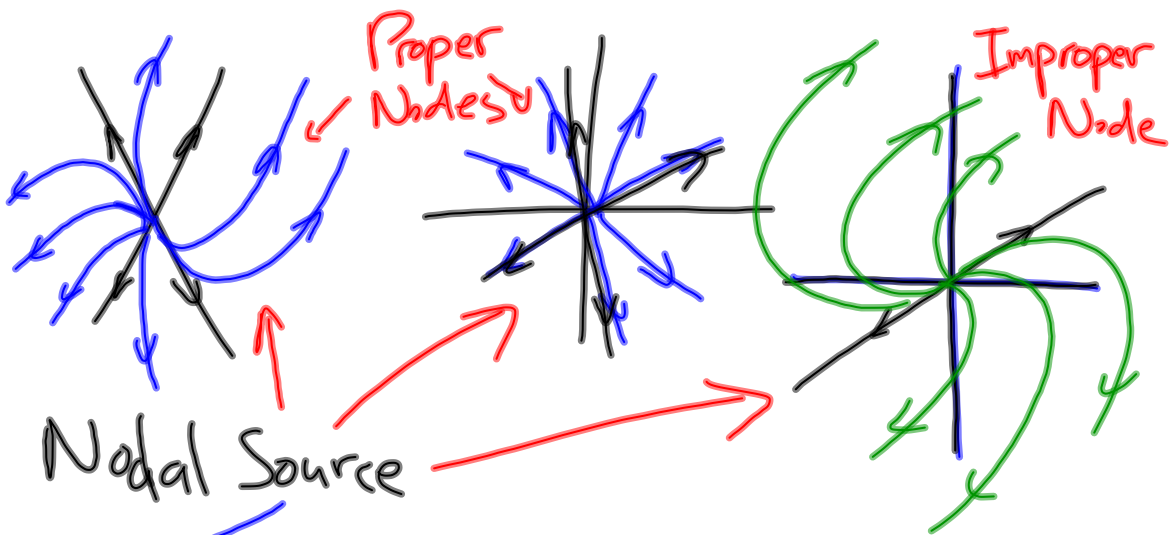
$$p_1 + p_2 = 1$$

$$A = \begin{bmatrix} 2 & -1 \\ 1 & 4 \end{bmatrix}$$

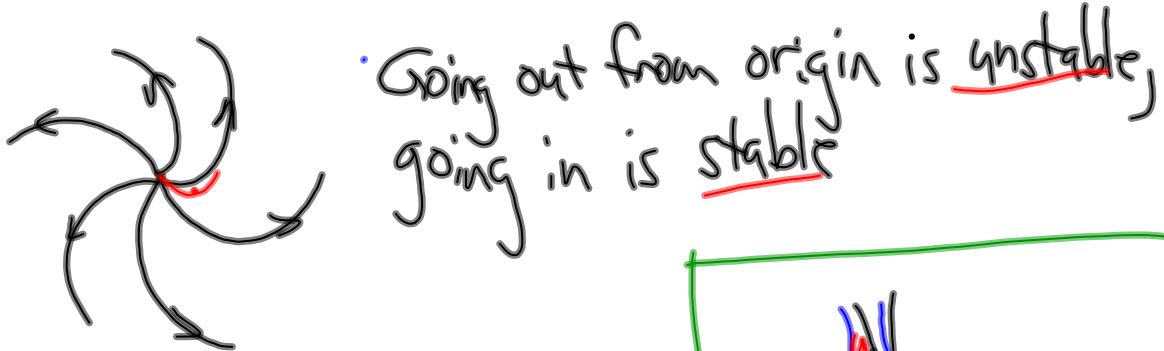
$$A \begin{bmatrix} 1 \\ 0 \end{bmatrix} = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$$

$$A \begin{bmatrix} 1 \\ 1 \end{bmatrix} = \begin{bmatrix} 1 \\ 5 \end{bmatrix}$$

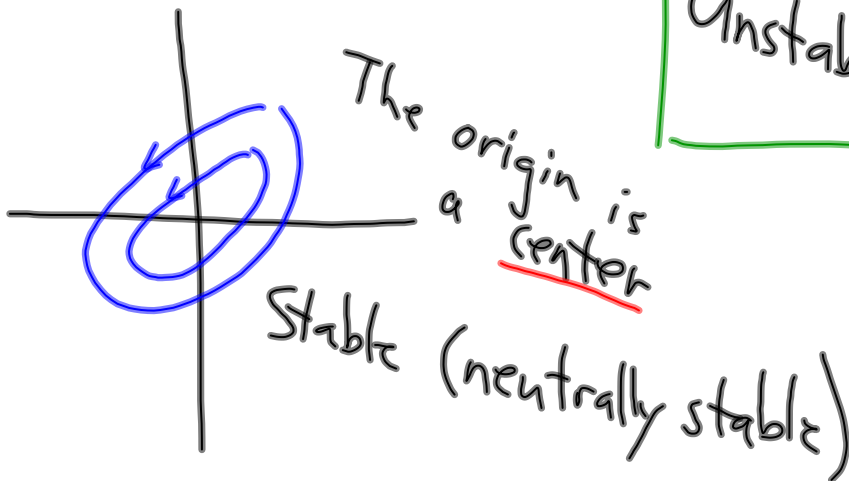
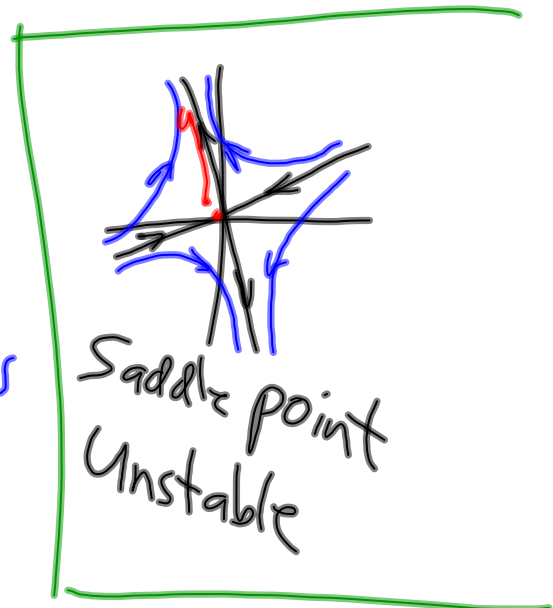
$$A \begin{bmatrix} 0 \\ 1 \end{bmatrix} = \begin{bmatrix} -1 \\ 4 \end{bmatrix}$$

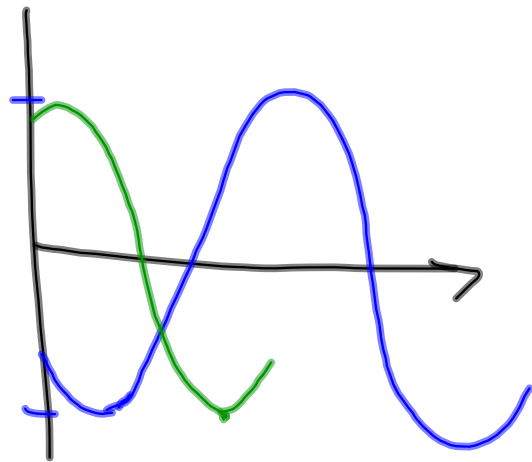
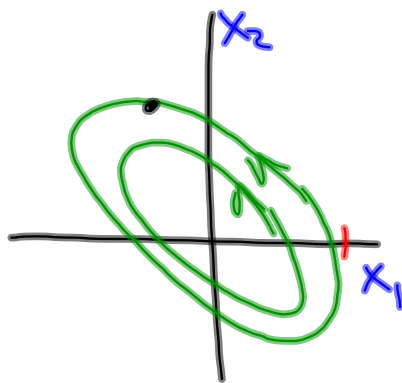
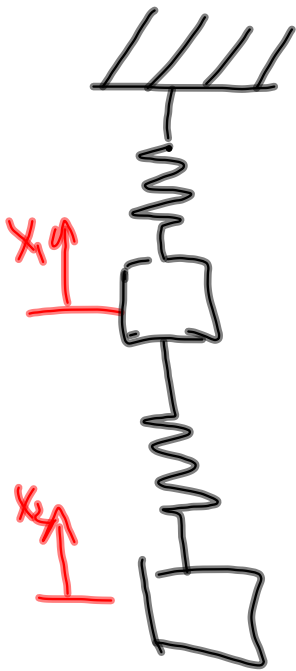


Sinks if all trajectories were inward.



Spiral source
Spiral sink - "travel"
is inward on all trajectories





$$x_1' = 3x_1 - 5x_2 + \sin 2t$$

$$x_2' = -x_1 + 2x_2 + e^{-3t}$$

$$x_1(0) = 3$$

$$x_2(0) = -1$$

$$\begin{bmatrix} x_1 \\ x_2 \end{bmatrix}' = \begin{bmatrix} 3 & -5 \\ -1 & 2 \end{bmatrix} \vec{x} + \begin{bmatrix} \sin 2t \\ e^{-3t} \end{bmatrix}$$

$$\vec{x}(0) = \begin{bmatrix} 3 \\ -1 \end{bmatrix}$$

$$\vec{x}' = A\vec{x} + \vec{f}$$

$$\vec{x}'(t) = A\vec{x}(t) + \vec{f}(t)$$

$$x^{(3)} + 2x'' - 7x' + 5x = 0$$

$$\textcircled{1} \quad x^{(3)} = -5x + 7x' - 2x''$$

$$\begin{cases} x_3' = -5x_1 + 7x_2 - 2x_3 \\ x_1' = x_2 \\ x_2' = x_3 \end{cases}$$

$$x_1' = 0x_1 + 1x_2 + 0x_3$$

$$x_2' = 0x_1 + 0x_2 + 1x_3$$

$$x_3' = -5x_1 + 7x_2 - 2x_3$$

$$\begin{bmatrix} x_1' \\ x_2' \\ x_3' \end{bmatrix} = \begin{bmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ -5 & 7 & -2 \end{bmatrix} \begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

$$\vec{x}' = A\vec{x}$$

$\textcircled{2}$ Let

$$x_1 = x$$

$$x_2 = x' = x_1'$$

$$x_3 = x'' = x_2'$$

$$x_3' = x''' = x^{(3)}$$

$$\begin{bmatrix} x_1 \\ x_2 \\ x_3 \end{bmatrix}$$

