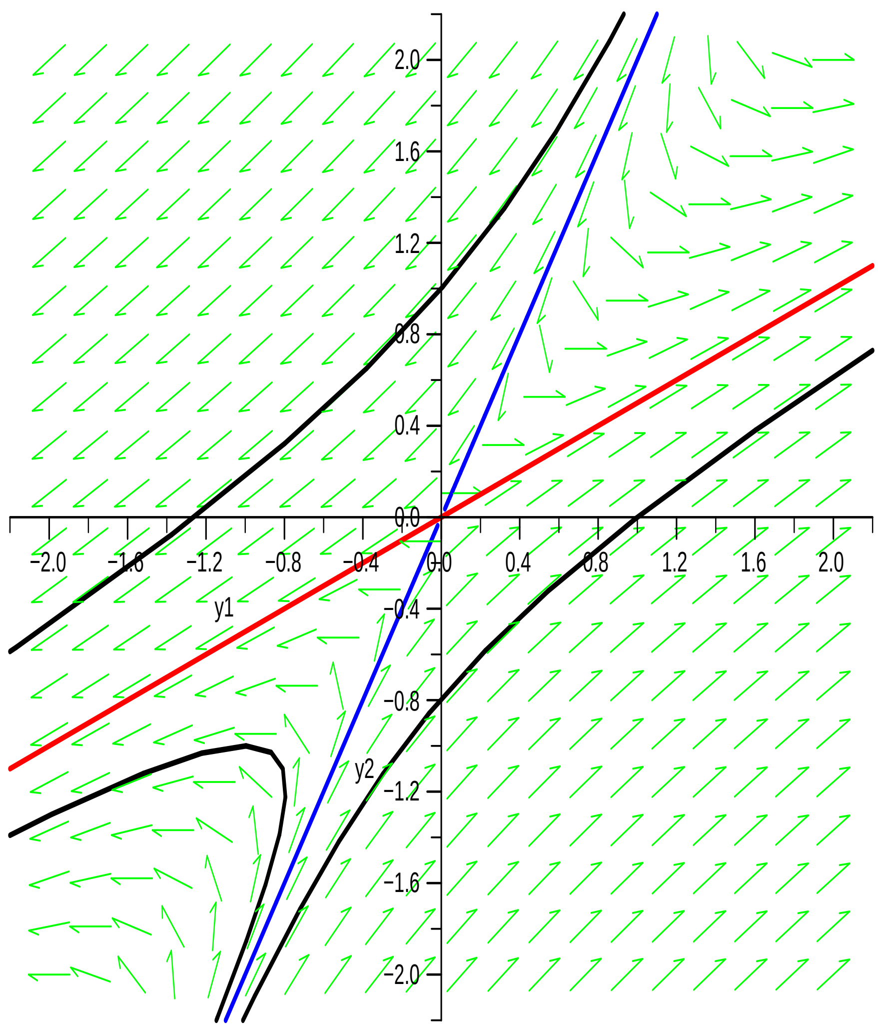
The phase plane for the system $\mathbf{x}' = A\mathbf{x}$ with $A = \begin{pmatrix} 3 & -2 \\ 2 & -2 \end{pmatrix}$, showing a **saddle point**. The general solution is

$$\mathbf{x} = c_1 e^{2t} \begin{pmatrix} 2 \\ 1 \end{pmatrix} + c_2 e^{-t} \begin{pmatrix} 1 \\ 2 \end{pmatrix}.$$

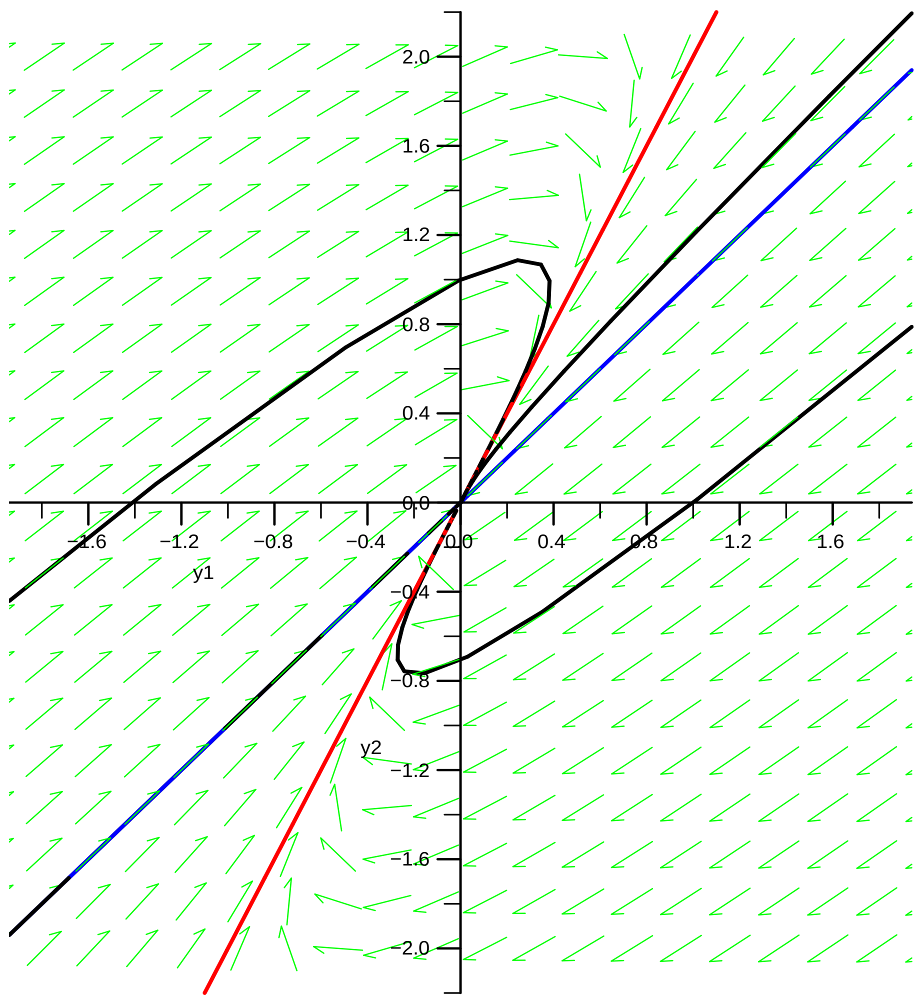
The red trajectories correspond to the choice $c_2 = 0$; these are straight lines representing movement directly away from the origin. The blue trajectories similarly correspond to $c_1 = 0$ and represent movement toward the origin. The black trajectories arise when both c_1 and c_2 are nonzero; the different trajectoris shown correspond to different chioces of signs of these parameters.



The phase plane for the system $\mathbf{x}' = A\mathbf{x}$ with $A = \begin{pmatrix} -5 & 2 \\ -4 & -1 \end{pmatrix}$, showing a **stable node**. The general solution is

$$\mathbf{x} = c_1 e^{-t} \begin{pmatrix} 1 \\ 2 \end{pmatrix} + c_2 e^{-3t} \begin{pmatrix} 1 \\ 1 \end{pmatrix}.$$

The red trajectories correspond to the choice $c_2 = 0$; these are straight lines representing movement directly toward the origin; all trajectories approach the origin parallel to these lines. The blue trajectories similarly correspond to $c_1 = 0$; all trajectories travel parallel to these lines when far from the origin. The black trajectories arise when both c_1 and c_2 are nonzero; the different trajectoris shown correspond to different chioces of signs of these parameters.



The phase plane for the system $\mathbf{x}' = A\mathbf{x}$ with $A = \begin{pmatrix} 1 & -2 \\ 2 & 1 \end{pmatrix}$, showing an **unstable spiral**. The general solution is

$$\mathbf{x} = c_1 e^t \begin{pmatrix} -\sin 2t \\ \cos 2t \end{pmatrix} + c_2 e^t \begin{pmatrix} \cos 2t \\ \sin 2t \end{pmatrix}.$$

All trajectories spiral out from the origin, moving counterclockwise.