Its eigenvalues and eigenvectors are
\[ r_1 = -1, \quad \xi^{(1)} = \begin{pmatrix} 1 \\ 0 \end{pmatrix}; \quad r_2 = -0.25, \quad \xi^{(2)} = \begin{pmatrix} 4 \\ -3 \end{pmatrix}, \quad (26) \]
and its general solution is
\[ \begin{pmatrix} u \\ v \end{pmatrix} = c_1 \begin{pmatrix} 1 \\ 0 \end{pmatrix} e^{-t} + c_2 \begin{pmatrix} 4 \\ -3 \end{pmatrix} e^{-0.25t}. \quad (27) \]
The point \((1, 0)\) is an asymptotically stable node of the linear system \((25)\) and of the nonlinear system \((21)\). If the initial values of \(x\) and \(y\) are sufficiently close to \((1, 0)\), then the interaction process will lead ultimately to that state, that is, to the survival of species \(x\) and the extinction of species \(y\). There is one pair of trajectories that approaches the critical point along the \(x\)-axis. All other trajectories approach \((1, 0)\) tangent to the line with slope \(-3/4\) that is determined by the eigenvector \(\xi^{(2)}\).

**\(x = 0, y = 2\).** The analysis in this case is similar to that for the point \((1, 0)\). The appropriate linear system is
\[ \frac{d}{dt} \begin{pmatrix} u \\ v \end{pmatrix} = \begin{pmatrix} -1 & 0 \\ -1.5 & -0.5 \end{pmatrix} \begin{pmatrix} u \\ v \end{pmatrix}. \quad (28) \]
The eigenvalues and eigenvectors of this system are
\[ r_1 = -1, \quad \xi^{(1)} = \begin{pmatrix} 1 \\ 3 \end{pmatrix}; \quad r_2 = -0.5, \quad \xi^{(2)} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}, \quad (29) \]
and its general solution is
\[ \begin{pmatrix} u \\ v \end{pmatrix} = c_1 \begin{pmatrix} 1 \\ 3 \end{pmatrix} e^{-t} + c_2 \begin{pmatrix} 0 \\ 1 \end{pmatrix} e^{-0.5t}. \quad (30) \]
Thus the critical point \((0, 2)\) is an asymptotically stable node of both the linear system \((28)\) and the nonlinear system \((21)\). All trajectories approach the critical point along the \(y\)-axis except for one trajectory that approaches along the line with slope \(3\).

**\(x = 0.5, y = 0.5\).** The corresponding linear system is
\[ \frac{d}{dt} \begin{pmatrix} u \\ v \end{pmatrix} = \begin{pmatrix} -0.5 & -0.5 \\ -0.375 & -0.125 \end{pmatrix} \begin{pmatrix} u \\ v \end{pmatrix}. \quad (31) \]
The eigenvalues and eigenvectors are
\[ r_1 = \frac{-5 + \sqrt{57}}{16} \approx 0.1594, \quad \xi^{(1)} = \left( \frac{1}{(-3 - \sqrt{57})/8} \right) \approx \begin{pmatrix} 1 \\ -1.3187 \end{pmatrix}, \quad (32) \]
\[ r_2 = \frac{-5 - \sqrt{57}}{16} \approx -0.7844, \quad \xi^{(2)} = \left( \frac{1}{(-3 + \sqrt{57})/8} \right) \approx \begin{pmatrix} 1 \\ 0.5687 \end{pmatrix}, \]
so the general solution is
\[ \begin{pmatrix} u \\ v \end{pmatrix} = c_1 \begin{pmatrix} 1 \\ -1.3187 \end{pmatrix} e^{0.1594t} + c_2 \begin{pmatrix} 1 \\ 0.5687 \end{pmatrix} e^{-0.7844t}. \quad (33) \]
Since the eigenvalues are of opposite sign, the critical point \((0.5, 0.5)\) is a saddle point, and therefore is unstable, as we had surmised earlier. One pair of trajectories approaches