

1. Find the general solution of the linear system $\mathbf{x}' = A\mathbf{x}$, where $\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$ and $A = \begin{pmatrix} -2 & -9 \\ 1 & -2 \end{pmatrix}$. Your answer should be expressed in terms of real functions.

2. Suppose that the 2×2 matrix A has eigenvalues r_1 and r_2 . In each case below, give the type of the critical point at the origin for the system $\mathbf{x}' = A\mathbf{x}$: spiral sink, spiral source, nodal sink, nodal source, center, or saddle point.

(a) $r_1 = 4i, r_2 = -4i$. Type: _____

(b) $r_1 = -2, r_2 = -5$. Type: _____

(c) $r_1 = -4, r_2 = 7$. Type: _____

1. Find the general solution of the linear system $\mathbf{x}' = A\mathbf{x}$, where $\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$ and $A = \begin{pmatrix} -1 & -4 \\ 1 & -1 \end{pmatrix}$. Your answer should be expressed in terms of real functions.

2. Suppose that the 2×2 matrix A has eigenvalues r_1 and r_2 . In each case below, give the type of the critical point at the origin for the system $\mathbf{x}' = A\mathbf{x}$: spiral sink, spiral source, nodal sink, nodal source, center, or saddle point.

(a) $r_1 = 2, r_2 = -5$. Type: _____

(b) $r_1 = 1 + i\sqrt{3}, r_2 = 1 - i\sqrt{3}$. Type: _____

(c) $r_1 = 3i, r_2 = -3i$. Type: _____

1. Find the general solution of the linear system $\mathbf{x}' = A\mathbf{x}$, where $\mathbf{x} = \begin{pmatrix} x_1 \\ x_2 \end{pmatrix}$ and $A = \begin{pmatrix} 1 & -9 \\ 1 & 1 \end{pmatrix}$. Your answer should be expressed in terms of real functions.

2. Suppose that the 2×2 matrix A has eigenvalues r_1 and r_2 . In each case below, give the type of the critical point at the origin for the system $\mathbf{x}' = A\mathbf{x}$: spiral sink, spiral source, nodal sink, nodal source, center, or saddle point.

(a) $r_1 = 2, r_2 = 5$. Type: _____

(b) $r_1 = 2i, r_2 = -2i$. Type: _____

(c) $r_1 = -1 + i\sqrt{3}, r_2 = -1 - i\sqrt{3}$. Type: _____