Linear System Summary

Math 230

Write the general solution to the system $\frac{d\mathbf{Y}}{dt} = \mathbf{AY}$ in each of the following cases. Then draw all possible types of phase portraits and say how the eigenvalues determine the type phase portrait.

1. Matrix $\mathbf{A}$ has distinct real eigenvalues, λ_1 and λ_2.

(a) Both λ_1 and λ_2 are nonzero.

(b) One eigenvalue is zero, the other is nonzero.

2. Matrix $\mathbf{A}$ has two complex conjugate eigenvalues, $\lambda = \alpha + i\beta$ and $\overline{\lambda} = \alpha - i\beta$.

over $\rightarrow$

3. Matrix $\mathbf{A}$ has a repeated eigenvalue λ with corresponding eigenvector $\mathbf{V}$, and no other eigenvector linearly independent to $\mathbf{V}$.

(a) $\lambda \neq 0$

(b) $\lambda = 0$

4. Matrix $\mathbf{A}$ has a repeated eigenvalue λ with linearly independent eigenvectors $\mathbf{V}_1$ and $\mathbf{V}_2$.

(a) $\lambda \neq 0$

(b) $\lambda = 0$