

18.03 Recitation 22, May 4, 2006

Complex or Repeated Eigenvalues

If A has a repeated eigenvalue λ_1 , find a nonzero eigenvector \mathbf{v} for it and then find \mathbf{w} such that $(A - \lambda_1 I)\mathbf{w} = \mathbf{v}$. Two basic solutions are then $e^{\lambda_1 t}\mathbf{v}$ and $e^{\lambda_1 t}(t\mathbf{v} + \mathbf{w})$.

Find basic real solutions for $\dot{\mathbf{u}} = A\mathbf{u}$ with

1. $A = \begin{bmatrix} -6 & -8 \\ 5 & 6 \end{bmatrix}$.

2. $A = \begin{bmatrix} -15 & -25 \\ 8 & 13 \end{bmatrix}$.

3. $A = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$.

4. Note that $A = \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix}$ is a companion matrix. What is the corresponding second order ODE? Find a basis for its solutions and compare them with what you found using matrix methods.