

Linear Algebra 2: Tutorial 8

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Summer 2023

Exercise 1. For each of the following matrices A in $\mathbb{C}^{3 \times 3}$, find the characteristic polynomial $p_A(\lambda)$ and all the complex eigenvalues of A . For each eigenvalue λ of A , find a basis for the eigenspace E_λ . Finally, determine whether \mathbb{C}^3 has a basis formed by eigenvectors of A .

$$(a) \ A = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 3 \end{bmatrix};$$

$$(b) \ A = \begin{bmatrix} 1 & 0 & 1 \\ 0 & 1 & 0 \\ 0 & 0 & 0 \end{bmatrix};$$

$$(c) \ A = \begin{bmatrix} 1 & 1 & 1 \\ 1 & 1 & 1 \\ 1 & 1 & 1 \end{bmatrix};$$

$$(d) \ A = \begin{bmatrix} 3 & 0 & -2 \\ -7 & 0 & 4 \\ 4 & 0 & -3 \end{bmatrix};$$

$$(e) \ A = \begin{bmatrix} -1 & 0 & 1 \\ -3 & 0 & 1 \\ -4 & 0 & 3 \end{bmatrix};$$