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Assignment Markov_II due 12/31/2021 at 02:09pm EET

Problem 1. **(1 point)** METUNCC/Linear_Algebra/2x2-eig_def.pg

The matrix $A = \begin{bmatrix} -8 & -4 \\ -1 & -5 \end{bmatrix}$ has an eigenvalue $\lambda = -9$.

Find an eigenvector for this eigenvalue.

$\vec{v} = \begin{bmatrix} \_\_ \\ \_\_ \end{bmatrix}$

Note: You should solve the following problem **WITHOUT** computing all eigenvalues.

The matrix $B = \begin{bmatrix} -2 & 2 \\ -1 & -5 \end{bmatrix}$ has an eigenvector $\vec{v} = \begin{bmatrix} -7 \\ 7 \end{bmatrix}$.

Find the eigenvalue for this eigenvector.

$\lambda = \_\_\_$

Problem 2. **(1 point)** METUNCC/Linear_Algebra/3x3-eig_def.pg

The matrix $A = \begin{bmatrix} 4 & 3 & 3 \\ -8 & -4 & -10 \\ -3 & -2 & -2 \end{bmatrix}$ has an eigenvalue $\lambda = -2$.

Find an eigenvector for this eigenvalue.

$\vec{v} = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$

Note: You should solve the following problem **WITHOUT** computing all eigenvalues.

The matrix $B = \begin{bmatrix} -6 & -4 & -2 \\ 3 & 5 & -6 \\ 2 & 3 & -3 \end{bmatrix}$ has an eigenvector $\vec{v} = \begin{bmatrix} 2 \\ -2 \\ -1 \end{bmatrix}$.

Find the eigenvalue for this eigenvector.

$\lambda = \_\_\_$

Problem 3. **(1 point)** METUNCC/Linear_Algebra/3x3-eigenval_3.pg

Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} -1 & 3 & 5 \\ 0 & 2 & 0 \\ -3 & 0 & -9 \end{bmatrix}$

$\lambda_1 = \_\_\_, \vec{v}_1 = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$

and

$\lambda_2 = \_\_\_, \vec{v}_2 = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$

and

$\lambda_3 = \_\_\_, \vec{v}_3 = \begin{bmatrix} \_\_ \\ \_\_ \\ \_\_ \end{bmatrix}$

Problem 4. **(1 point)** METUNCC/Applied_Math/markov/Tn.pg

The matrix T has eigenvalues and eigenvectors:

- $\mathbf{v}_1 = \begin{bmatrix} 1 \\ 2 \\ -3 \end{bmatrix}$, with $\lambda_1 = 1$.
- $\mathbf{v}_2 = \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix}$, with $\lambda_2 = \frac{1}{2}$.
- $\mathbf{v}_3 = \begin{bmatrix} 0 \\ 1 \\ 3 \end{bmatrix}$, with $\lambda_3 = \frac{2}{3}$.

Give formulas for the following:

(A) $\mathrm{T}^n \begin{bmatrix} 0 \\ 0 \\ 1 \end{bmatrix} = \begin{bmatrix} \_\_\_\_ \\ \_\_\_ \\ \_\_\_ \end{bmatrix}$

(B) $\mathrm{T}^n \begin{bmatrix} 0 \\ -2 \\ -6 \end{bmatrix} = \begin{bmatrix} \_\_\_\_ \\ \_\_\_ \\ \_\_\_ \end{bmatrix}$

(C) $\mathrm{T}^n \left(\begin{bmatrix} 3 \\ 6 \\ -9 \end{bmatrix} + \begin{bmatrix} 0 \\ 0 \\ 2 \end{bmatrix} + \begin{bmatrix} 0 \\ 4 \\ 12 \end{bmatrix} \right) = \begin{bmatrix} \_\_\_\_\_ \\ \_\_\_\_\_ \\ \_\_\_\_\_ \end{bmatrix}$

(D) $\mathrm{T}^n \begin{bmatrix} 1 \\ -1 \\ -15 \end{bmatrix} = \begin{bmatrix} \_\_\_\_\_ \\ \_\_\_\_\_ \\ \_\_\_\_\_ \end{bmatrix}$