Multivar Exam #3 Saaif Ahmed PG 2

Honor Pledge:

"I have neither given nor received any illegal aid on this exam"

-Saaif Ahmed 12/9/20

Problem 8

Find the eigenvalues and eigenvectors of the matrix $A = \begin{bmatrix} 1 & -1 & 0 \\ 0 & 1 & 4 \\ 0 & -1 & 1 \end{bmatrix}$.

$(1-\lambda)((1-\lambda)^2+4)$

$\lambda = 1, 1 \pm 2i$

Eigenvalues: $1, 1+2i, 1-2i$

Matrices

$\begin{bmatrix} 0 & -1 & 0 \\ 0 & 0 & 4 \\ 0 & -1 & 0 \end{bmatrix}$

$-y = 0, -z = 0, x\ is\ unbound$

Vector: $\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}$

$\begin{bmatrix} -2i & -1 & 0 \\ 0 & -2i & 4 \\ 0 & -1 & -2i \end{bmatrix}$

$-2ix - y = 0$

$-2iy + 4z = 0$

$y = -2ix$

$y = 2iz$

$-2ix = 2iz$

$x = -z$

Vector: $\begin{bmatrix} 1 \\ \frac{i}{2} \\ -1 \end{bmatrix}$

$\begin{bmatrix} 2i & -1 & 0 \\ 0 & 2i & 4 \\ 0 & -1 & 2i \end{bmatrix}$

$2ix - y = 0$

$x = -\frac{i}{2}y$

$y = 2iz$

Vector: $\begin{bmatrix} 1 \\ -\frac{i}{2} \\ 1 \end{bmatrix}$

Answer:

Eigenvalues: $1, 1+2i, 1-2i$

Eigen vectors

$\begin{bmatrix} 1 \\ 0 \\ 0 \end{bmatrix}, \begin{bmatrix} 1 \\ \frac{i}{2} \\ -1 \end{bmatrix}, \begin{bmatrix} 1 \\ -\frac{i}{2} \\ 1 \end{bmatrix}$