

Find the characteristic polynomial of the matrix:

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

list all the eigenvalues and eigenvectors for

$$\begin{bmatrix} 0 & 1 & 1 \\ 2 & 1 & 2 \\ 3 & 3 & 2 \end{bmatrix}. \text{ (Hint: } \lambda = -1, \text{ is an eigenvalue for this matrix.)}$$

list all the eigenvalues and eigenvectors for

$$\begin{bmatrix} 2 & -2 & -2 \\ 3 & -3 & -2 \\ 2 & -2 & -2 \end{bmatrix}.$$