Assignment #9
January 12, 2023

1. Find the characteristic polynomial of A. Use x for the variable in your polynomial.

$$A = \begin{bmatrix} -3 & 4 & 2 \\ 0 & -4 & -1 \\ 0 & 6 & 1 \end{bmatrix}$$

2. List all the distinct eigenvalues of A.

$$A = \begin{bmatrix} 3 & 18 & 8 \\ 0 & -15 & -8 \\ 0 & 24 & 13 \end{bmatrix}$$

3. If A is a 5×5 matrix with characteristic polynomial $x^5 + 4x^4 - 5x^3$, find the distinct eigenvalues of A and their multiplicities.

4. Find all distinct (real or complex) eigenvalues of A_i. Then find the basic eigenvectors of A corresponding to each eigenvalue. For each eigenvalue, specify the number of basic eigenvectors corresponding to that eigenvalue, then write the eigenvalue followed by the basic eigenvectors corresponding to that eigenvalue.

$$A_1 = \begin{bmatrix} -2 & 13 \\ -2 & 8 \end{bmatrix} \quad A_2 = \begin{bmatrix} 5 & 3 & 0 \\ -6 & -4 & 0 \\ -6 & -3 & -1 \end{bmatrix}$$

5. Find the basic eigenvectors of A corresponding to the eigenvalue provided.

$$A = \begin{bmatrix} -5 & 0 & -3 \\ 0 & -2 & 0 \\ 6 & 0 & 4 \end{bmatrix}, \quad \lambda = 1$$

6. For the matrix A below, find a value of k so that A has two eigenvectors associated with the eigenvalue -3.

$$A = \begin{bmatrix} -3 & -4 & 8 & -12 \\ 0 & -1 & k & 14 \\ 0 & 0 & -3 & 8 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \quad \lambda = -3$$

7. Find an invertible matrix P and diagonal matrix D such that $P^{-1}AP = D$.

$$A = \begin{bmatrix} -11 & 0 & 18 \\ 2 & 0 & -4 \\ -6 & 0 & 10 \end{bmatrix}$$