MA 138 Worksheet #19

Section 9.3

3/19/24

1 Given that $\mathbf{v}_1 = \begin{bmatrix} 1 \\ -1 \end{bmatrix}$ and $\mathbf{v}_2 = \begin{bmatrix} 0 \\ -1 \end{bmatrix}$ are eigenvectors of the matrix $A = \begin{bmatrix} 1 & 0 \\ -7 & -6 \end{bmatrix}$, determine the corresponding eigenvalues λ_1 and λ_2.

Remark: do you notice something special about the eigenvalues?

2 The matrix $A = \begin{bmatrix} -7 & 2 \\ -3 & -2 \end{bmatrix}$ has eigenvalues -5 and -4. Find the corresponding eigenvectors.

3 Find the eigenvalues of the matrix $A = \begin{bmatrix} 22 & -72 \\ 6 & -20 \end{bmatrix}$.

4 Let $A = \begin{bmatrix} -5 & -9 \\ -8 & k \end{bmatrix}$. Find the value of k so that A has 0 as an eigenvalue.

5 The matrix $A = \begin{bmatrix} 4 & k \\ -3 & -4 \end{bmatrix}$ has two distinct real eigenvalues if and only if k strictly less than what?

6 Consider the matrix $A = \begin{bmatrix} 2 & -6 \\ 0 & -1 \end{bmatrix}$. We can show that A has eigenvectors $\mathbf{v}_1 = \begin{bmatrix} -1 \\ 0 \end{bmatrix}$ and $\mathbf{v}_2 = \begin{bmatrix} 2 \\ 1 \end{bmatrix}$

(a) Find the corresponding eigenvalues of A.

(b) Find coefficients c_1 and c_2 so that $\mathbf{v} = \begin{bmatrix} 11 \\ 4 \end{bmatrix} = c_1\mathbf{v}_1 + c_2\mathbf{v}_2$.

(c) Use your result in part (b) evaluate $A^{10}\mathbf{v}$.