WORKSHEET 3/22/23
MATH 2331, SPRING 2023

(1) Let $A = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -1 \end{bmatrix}$. Calculate A^5, $\det(A)$, and $\operatorname{rank}(A)$. Find a basis for $\ker(A)$.

(2) Can you find an eigenvector of the identity matrix? What is the eigenvalue?

(3) Can you find an eigenvector for projection onto the line parallel to $\begin{bmatrix} 3 \\ 4 \end{bmatrix}$? Can you find another? What are the eigenvalues?

(4) What can you say about an eigenvector with eigenvalue 0?

(5) Can you find an eigenvector for rotation by an angle θ in $\mathbb{R}^2$? What is the eigenvalue?

(6) Can you find an eigenvector for reflection across the line parallel to $\begin{bmatrix} 3 \\ 4 \end{bmatrix}$? Can you find another? What are the eigenvalues?

(7) What can you say about the eigenvalues of an orthogonal matrix?