

Worksheet Power Method and Orthogonal projection

Name and section: _____

Instructor's name: _____

- Find the dominant eigenvalue and corresponding eigenvectors of the matrix $\begin{bmatrix} 2 & -1 \\ -1 & 2 \end{bmatrix}$.
- Apply the power method $v_{k+1} = Av_k$ to problem (1) and perform six iterations with initial guess $v_0 = \begin{bmatrix} 1 \\ 0 \end{bmatrix}$. What is the value of limiting vector v_∞ ?

- Find the first three iterations obtained by the Power method applied to matrix $\begin{bmatrix} 2 & 1 & 1 \\ 1 & 2 & 1 \\ 1 & 1 & 2 \end{bmatrix}$; Use

$$x_0 = \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix}$$

- Also, solve the problem (3) for smallest eigenvalue and corresponding eigenvector using the Inverse Power method.
- Find the orthogonal projection $\vec{x}^\parallel = \text{proj}_v(\vec{x})$ of the vector $\vec{x} = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$, onto vector $\vec{v} = \begin{bmatrix} -1 \\ 0 \\ 1 \end{bmatrix}$.

- Find the orthogonal projection of $\begin{bmatrix} 9 \\ 0 \\ 0 \\ 0 \end{bmatrix}$ onto the subspace of \mathbb{R}^4 spanned by

$$\begin{bmatrix} 2 \\ 2 \\ 1 \\ 0 \end{bmatrix} \quad \text{and} \quad \begin{bmatrix} -2 \\ 2 \\ 0 \\ 1 \end{bmatrix}.$$