



Quiz 6

Numerical Analysis Spring 2023

Name: _____

NetID:

Show your work!

Problem 1. Define

$$\mathbf{A} = \begin{bmatrix} 1 & 1 \\ 1 & -1 \end{bmatrix} \begin{bmatrix} 5 & \\ & 4 \end{bmatrix} \begin{bmatrix} 3/5 & 4/5 \\ -4/5 & 3/5 \end{bmatrix}.$$

Find an eigenvector \mathbf{v} of $\mathbf{A}^T \mathbf{A}$ and the corresponding eigenvalue λ . (7pts)

Hint: Think about what structure each of the factors above have (note also that $3^2 + 4^2 = 5^2$)

Problem 2. Define

$$\mathbf{B} = \begin{bmatrix} 1 & & \\ & 2 & \\ & & -4 \end{bmatrix}, \quad \mathbf{x} = \begin{bmatrix} -2 \\ 3 \\ 1 \end{bmatrix}.$$

1. Let k be a positive integer. What is $\mathbf{B}^k \mathbf{x}$? (2pts)

2. Compute the limit that exists: $\lim_{k \rightarrow \infty} \mathbf{B}^k \mathbf{x} / \|\mathbf{B}^k \mathbf{x}\|$ or $\lim_{k \rightarrow \infty} (-1)^k \mathbf{B}^k \mathbf{x} / \|\mathbf{B}^k \mathbf{x}\|$. (6pts)