



Quiz 5

Numerical Analysis Spring 2023

Name: _____

NetID:

Problem 1. Define

$$\mathbf{A} = \begin{bmatrix} 0 & 1 & -1 \\ 2 & 0 & 1 \\ 2 & -1 & -1 \\ 2 & 1 & 0 \end{bmatrix}, \quad \mathbf{b} = \begin{bmatrix} 6 \\ 12 \\ -6 \\ -6 \end{bmatrix}.$$

There are more than 15 possible points, but the quiz is still worth 15 points total (so scores above 15 will be rounded back to 15). *Justify/show your work!*

1. Show \mathbf{A} has orthogonal columns, and compute the norm of each column. (3pts)

2. What is the condition number of \mathbf{A} ? (3pts)

3. Find the solution \mathbf{x} to the least squares problem $\min_{\mathbf{x} \in \mathbb{R}^3} \|\mathbf{b} - \mathbf{A}\mathbf{x}\|_2^2$. (10pts)
Hint: think about what Problem 1 tells you about the structure of $\mathbf{A}^T\mathbf{A}$.