Quiz 3a — Numerical Analysis Fall 2024

Name: _____ NetID: | | | | | | | | | |

Do not begin until instructed.

Problem 1 (5pts)**.** Define

$$\mathbf{D} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \qquad \mathbf{b} = \begin{bmatrix} 2 \\ 3 \\ 4 \\ 1 \end{bmatrix}$$

Find the vector $\mathbf{y}$ so that $\mathbf{Dy} = \mathbf{b}$.

$$\mathbf{y} = \begin{bmatrix} \\ \\ \\ \end{bmatrix}$$

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Problem 2 (10pts)**.** Define

$$\mathbf{A} = \mathbf{DQ}, \qquad \mathbf{D} = \begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 3 & 0 & 0 \\ 0 & 0 & 2 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}, \qquad \mathbf{Q} = \frac{1}{2}\begin{bmatrix} 1 & 1 & 1 & 1 \\ 1 & -1 & 1 & -1 \\ 1 & 1 & -1 & -1 \\ 1 & -1 & -1 & 1 \end{bmatrix}, \qquad \mathbf{b} = \begin{bmatrix} 2 \\ 3 \\ 4 \\ 1 \end{bmatrix}$$

Find the vector $\mathbf{x}$ so that $\mathbf{Ax} = \mathbf{b}$. *Hint*: note that $\mathbf{Q}^\mathsf{T}\mathbf{Q} = \mathbf{I}$.

$$\mathbf{x} = \begin{bmatrix} \\ \\ \\ \end{bmatrix}$$

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