

Q1

$$AB = \begin{pmatrix} 3 & 0 & 8 & -1 \\ 9 & 4 & 4 & 0 \\ 6 & 0 & 16 & -2 \\ 15 & -2 & 0 & 2 \end{pmatrix}$$

$$BA = \begin{pmatrix} 3 & 0 & 6 & -3 \\ 6 & 4 & 2 & 0 \\ 8 & 0 & 16 & -8 \\ 5 & -1 & 0 & 2 \end{pmatrix}$$

$$AC = \begin{pmatrix} 2 & 1 \\ 4 & 12 \\ 4 & 2 \\ 7 & 9 \end{pmatrix}$$

$$wv = -1 \quad vw = \begin{pmatrix} 1 & 0 & -1 \\ -3 & 0 & 3 \\ 2 & 0 & -2 \end{pmatrix}$$

$$B^T = \begin{pmatrix} 3 & 0 & 0 & 0 \\ 0 & 2 & 0 & 0 \\ 0 & 0 & 4 & 0 \\ 0 & 0 & 0 & 1 \end{pmatrix}$$

$$C^T = \begin{pmatrix} 1 & 0 & 1 & 1 \\ 2 & 3 & 0 & 1 \end{pmatrix}$$

$\det(A) = 0$  (TO BE JUSTIFIED)

$\det(B) = 24$  (TO BE JUSTIFIED)

$\|v\|_\infty = 3$  (TO BE JUSTIFIED)

$\|v\|_1 = 6$  (TO BE JUSTIFIED)

$\|w^T\|_2 = \sqrt{2}$  (TO BE JUSTIFIED)

B IS NOT ORTHOGONAL (TO BE JUSTIFIED)

Q2

T IS LINEAR (TO BE JUSTIFIED)

S IS NOT LINEAR (TO BE JUSTIFIED)

Q3

A REDUCED FORM OF THE LINEAR SYSTEM IS

$$\left( \begin{array}{cccc|c} 1 & 2 & 1 & -1 & 3 \\ 0 & 0 & 1 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{array} \right) \quad (\text{TO BE JUSTIFIED})$$

THE SYSTEM HAS INFINITE SOLUTIONS:

$$\begin{pmatrix} x_1 \\ x_2 \\ x_3 \\ x_4 \end{pmatrix} = \begin{pmatrix} 1 - 2s + 2t \\ s \\ 2 - t \\ t \end{pmatrix} \quad \text{WITH } s, t \in \mathbb{R} \quad (\text{TO BE JUSTIFIED})$$

THE RANK OF THE MATRIX ASSOCIATED WITH THE LINEAR SYSTEM IS 2 (TO BE JUSTIFIED)