

Name: _____
MATH 108
Fall 2023
HW 13: Due 12/12

"You can't learn too much linear algebra."

–Benedict Gross

Problem 1. (10pt) Define the following:

$$\mathbf{u} = \begin{pmatrix} 1 \\ -1 \\ 5 \\ 7 \end{pmatrix}, \quad \mathbf{v} = \begin{pmatrix} 0 \\ 2 \\ 4 \\ -6 \end{pmatrix}, \quad \mathbf{w} = \begin{pmatrix} 8 \\ 1 \\ 0 \\ 5 \end{pmatrix}$$

Showing all your work, compute the following:

- (a) $-3\mathbf{v}$
- (b) $\mathbf{w} - \mathbf{u}$
- (c) $\mathbf{v} \cdot \mathbf{w}$

Problem 2. (10pt) Define the following:

$$A = \begin{pmatrix} 1 & 3 & 0 \\ -2 & 5 & 2 \end{pmatrix}, \quad B = \begin{pmatrix} 8 & 4 & -1 \\ 2 & 0 & 6 \end{pmatrix}, \quad C = \begin{pmatrix} 1 & 7 & 3 \\ -2 & 6 & 0 \end{pmatrix}$$

Showing all your work, compute the following:

(a) $-4B$

(b) $C - A$

(c) AB^T

Problem 3. (10pt) Define the following:

$$A = \begin{pmatrix} 4 & 6 & 1 & 0 & 5 \\ -1 & 2 & -3 & 0 & 4 \end{pmatrix}, \quad \mathbf{u} = \begin{pmatrix} 1 \\ 0 \\ 2 \\ 0 \\ -3 \end{pmatrix}$$

- (a) Can one compute $A\mathbf{u}$? If so, compute it. If not, explain why.
- (b) Can one compute $A^T\mathbf{u}$? If so, compute it. If not, explain why.