Name: _____

MATH 108
Fall 2022
HW 15: Due 11/22

"There is hardly any theory which is more elementary [than linear algebra], in spite of the fact that generations of professors and textbook writers have obscured its simplicity by preposterous calculations with matrices."

–Jean Dieudonné

Problem 1. (10pt) Let $\mathbf{u}, \mathbf{v} \in \mathbb{R}^4$ be the following vectors: $\mathbf{u} = \begin{pmatrix} 1 \\ -2 \\ 3 \\ 4 \end{pmatrix}$ and $\mathbf{v} = \begin{pmatrix} 10 \\ 8 \\ -2 \\ 3 \end{pmatrix}$.

Compute the following:

(a) $-2\mathbf{u}$

(b) $\mathbf{v} - \mathbf{u}$

(c) $\mathbf{u} \cdot \mathbf{v}$

(d) $\mathbf{v}^T$

Problem 2. (10pt) Define the following matrices:

$$A = \begin{pmatrix} 3 & 6 & 2 \\ -9 & 3 & -8 \end{pmatrix}, \qquad B = \begin{pmatrix} 1 & -4 & 2 \\ 1 & -8 & -3 \end{pmatrix}$$

Compute the following:

(a) $3B$

(b) $A + B$

(c) A^T

(d) $A^T B$

Problem 3. (10pt) Define the following matrices:

$$A = \begin{pmatrix} 1 & 0 \\ -2 & 3 \\ 0 & -1 \end{pmatrix}, \qquad B = \begin{pmatrix} 1 & 0 & -1 & 5 \end{pmatrix}, \qquad C = \begin{pmatrix} 2 & 0 \\ -1 & 3 \end{pmatrix}$$

Only one of the following is computable: CA, AB, or AC. For those products that cannot be computed, explain why. For the product that can be computed, compute the product.