Linear Algebra - Worksheet

Read this article before beginning the exercises: Linear Algebra Explained in 4 Pages

This assignment consists of 3 parts:

- Matrix Dimensions
- Vector Operations
- Matrix Operations

After completing the exercises by hand, use Python to check your work.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 7 & 4 \end{bmatrix} \quad B = \begin{bmatrix} 1 & -1 \\ 0 & 1 \end{bmatrix} \quad C = \begin{bmatrix} 5 & -1 \\ 9 & 1 \\ 6 & 0 \end{bmatrix} \quad D = \begin{bmatrix} 3 & -2 & -1 \\ 1 & 2 & 3 \end{bmatrix}$$

$$u = \begin{bmatrix} 6 & 2 & -3 & 5 \end{bmatrix}$$
 $v = \begin{bmatrix} 3 & 5 & -1 & 4 \end{bmatrix}$ $w = \begin{bmatrix} 1 \\ 8 \\ 0 \\ 5 \end{bmatrix}$

1. Matrix Dimensions

Write the dimensions of each matrix.

- 1.1) A
- 1.2) B
- 1.3) C
- 1.4) D
- 1.5) u
- $1.6) \ w$

2. Vector Operations

Perform the following operations. Assume $\alpha = 6$.

- $2.1) \vec{u} + \vec{v} =$
- $(2.2) \ \vec{u} \vec{v} =$
- $2.3) \alpha \vec{u} =$
- $2.4) \ \vec{u} \cdot \vec{v} =$
- $2.5) \|\vec{u}\| =$

3. Matrix Operations

Evaluate each of the following expressions, if it is defined; else fill in with "not defined." Do your work by hand on scratch paper.

- 3.1) A + C =
- $3.2) A C^T =$
- $3.3) C^T + 3D =$
- 3.4) BA =
- $3.5) BA^T =$

Optional

- 3.6) BC =
- 3.7) CB =
- $3.8) B^4 =$
- $3.9) AA^{T} =$
- $3.10) D^T D =$