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.

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

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

1. Matrix Dimensions

Write the dimensions of each matrix.

1.1) A 2x3

1.2) B 2x2

1.3) C 3x2

1.4) D 2x3

1.5) u 1x4

1.6) w 4x1

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2. Vector Operations

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

2.1) $\vec{u} + \vec{v} =$ [9 7 -4 9]

2.2) $\vec{u}$ - $\vec{v} =$ [3 -3 -2 1]

2.3) $\alpha\vec{u} =$ [36 12 -18 30]

2.4) $\vec{u} \cdot \vec{v} =$ 51

2.5) $\|\vec{u}\| =$ (74)^0.5

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) $A + C =$ not defined

3.2) $A - C^T =$ [[-4, -7, -3] , [3, 6, 4]]

3.3) $C^T + 3D =$ [[5, -14, -6] , [6, 12, 13]]

3.4) $BA =$ [[-1, -5, -1] , [3, 9, 7]]

3.5) $BA^T =$ not defined

Optional

3.6) $BC =$

3.7) $CB =$

3.8) $B^4 =$

3.9) $AA^T =$

3.10) $D^T D =$