Linear Algebra Self-check test

Wigner Data and Compute Intensive Sciences Group

Name: _____

Part 1: Dot Product

Calculate the dot product of the following vectors:

1. $\begin{bmatrix} 2 \\ -1 \\ 3 \end{bmatrix} \cdot \begin{bmatrix} 1 \\ 4 \\ -2 \end{bmatrix} =$ _____

2. $\begin{bmatrix} 3 \\ 0 \\ -1 \\ 2 \end{bmatrix} + \begin{bmatrix} -2 \\ 5 \\ 1 \\ 3 \end{bmatrix} =$ _____

Part 2: Vector-Matrix Multiplication

Multiply the vector with the matrix:

3. $\begin{bmatrix} 1 & -2 \\ 3 & 0 \\ -1 & 4 \end{bmatrix} \begin{bmatrix} 2 \\ 1 \end{bmatrix} =$ _____

4. $\begin{bmatrix} 3 & 0 & 1 \\ 1 & 2 & -1 \end{bmatrix} \begin{bmatrix} 1 \\ -1 \\ 2 \end{bmatrix} =$ _____

Part 3: Matrix-Matrix Multiplication

Multiply the matrices:

5. $\begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \begin{bmatrix} 0 & 1 \\ -1 & 2 \end{bmatrix} =$ _____

6. $\begin{bmatrix} 2 & 1 & 0 \\ -1 & 0 & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 0 & -1 \\ 3 & 0 \end{bmatrix} =$ _____

7. $\begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} =$ _____

Part 4: Matrix Determinant

Calculate the determinant:

8. $\det \begin{pmatrix} 3 & 1 \\ 2 & 4 \end{pmatrix} =$ _____

9. $\det \begin{pmatrix} 2 & -1 & 0 \\ 1 & 3 & 2 \\ 0 & 1 & -1 \end{pmatrix} =$ _____

Part 5: Eigenproblems

10. For $A = \begin{bmatrix} 3 & 0 \\ 0 & -1 \end{bmatrix}$:

    - Eigenvalues: _____, _____
    - Corresponding eigenvectors: _____, _____

11. Which vector is an eigenvector of $\begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$?

    Choose the correct answer! $\begin{bmatrix} 1 \\ 1 \end{bmatrix}$ $\begin{bmatrix} 1 \\ -1 \end{bmatrix}$ Both Neither