Introductory Linear Algebra Problems and Core Operations

Solved Introductory Linear Algebra Problems

Problem 1: Vector Addition
u = [2, -1, 3], v = [4, 0, -2]

u + v = [6, -1, 1]

Problem 2: Scalar Multiplication
u = [3, -2, 5]^T

2u = [6, -4, 10]^T

Problem 3: Matrix Addition
A = [[1, 2], [3, 4]], B = [[5, -1], [2, 0]]

A + B = [[6, 1], [5, 4]]

Problem 4: Matrix Multiplication
A = [[1, 2], [3, 4]], B = [[2, 0], [1, 2]]

AB = [[4, 4], [10, 8]]

Problem 5: Dot Product of Vectors
u = [1, 3, -5], v = [4, -2, -1]

u · v = 3

Core Matrix and Vector Operations

Vector Addition
Combines vectors of the same dimension by adding corresponding components.

Scalar Multiplication
Multiplies every element of a vector or matrix by a scalar.

Matrix Addition
Adds matrices element-by-element. Matrices must have identical dimensions.

Matrix Multiplication
Multiplies rows of the first matrix with columns of the second matrix.

Dot Product
Multiplies corresponding vector elements and sums the results.