Assignment 8

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***Abstract*—This document deals with matrix multiplication.**

Download python codes from

https://github.com/neharani289/MatrixTheory/tree/master/Assignment8/codes

Download latex-tikz codes from

https://github.com/neharani289/MatrixTheory/tree/master/Assignment8

1 Problem

Let

$$\mathbf{A} = \begin{pmatrix} 2 & -1 & 1 \\ 1 & 2 & 1 \end{pmatrix}, \mathbf{B} = \begin{pmatrix} 3 \\ 1 \\ -1 \end{pmatrix}, \quad \mathbf{C} = \begin{pmatrix} 1 & -1 \end{pmatrix} \tag{1.0.1}$$

Compute **ABC** and **CAB**.

2 Solution

Given,

$$\mathbf{A} = \begin{pmatrix} 2 & -1 & 1 \\ 1 & 2 & 1 \end{pmatrix} \tag{2.0.1}$$

$$\mathbf{B} = \begin{pmatrix} 3 \\ 1 \\ -1 \end{pmatrix} \tag{2.0.2}$$

$$\mathbf{C} = \begin{pmatrix} 1 & -1 \end{pmatrix} \tag{2.0.3}$$

Take, $\mathbf{ABC} = (\mathbf{AB})\,\mathbf{C}$

$$\mathbf{AB} = \begin{pmatrix} 2 & -1 & 1 \\ 1 & 2 & 1 \end{pmatrix} \begin{pmatrix} 3 \\ 1 \\ -1 \end{pmatrix} \tag{2.0.4}$$

$$\mathbf{AB} = \begin{pmatrix} 6-1-1 \\ 3+2-1 \end{pmatrix} \tag{2.0.5}$$

$$\mathbf{AB} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \tag{2.0.6}$$

Now,

$$\mathbf{ABC} = \begin{pmatrix} 4 \\ 4 \end{pmatrix} \begin{pmatrix} 1 & -1 \end{pmatrix} \tag{2.0.7}$$

$$\mathbf{ABC} = \begin{pmatrix} 4 & -4 \\ 4 & -4 \end{pmatrix} \tag{2.0.8}$$

similarly, $\mathbf{CAB} = \mathbf{C}(\mathbf{AB})$

$$\mathbf{CAB} = \begin{pmatrix} 1 & -1 \end{pmatrix} \begin{pmatrix} 4 \\ 4 \end{pmatrix} \tag{2.0.9}$$

$$\implies \mathbf{CAB} = \begin{pmatrix} 0 \end{pmatrix} \tag{2.0.10}$$

therefore,

$$\mathbf{ABC} = \begin{pmatrix} 4 & -4 \\ 4 & -4 \end{pmatrix} \tag{2.0.11}$$

$$\mathbf{CAB} = \begin{pmatrix} 0 \end{pmatrix} \tag{2.0.12}$$