Matrix theory Assignment 2

Sahil Kumar Singh

Abstract—**This document contains the solution of a matrix multiplication problem.**

1 Problem

1.1. For what value of x:

$$\begin{pmatrix}1 & 2 & 1\end{pmatrix}\begin{pmatrix}1 & 2 & 0\\ 2 & 0 & 1\\ 1 & 0 & 2\end{pmatrix}\begin{pmatrix}0\\ 2\\ x\end{pmatrix} = 0 \tag{1.1.1}$$

2 Solution

2.2. Below is the solution :

$$\begin{pmatrix}1 & 2 & 1\end{pmatrix}\begin{pmatrix}1 & 2 & 0\\ 2 & 0 & 1\\ 1 & 0 & 2\end{pmatrix}\begin{pmatrix}0\\ 2\\ x\end{pmatrix} = 0$$

$$\implies \left(\begin{pmatrix}1 & 2\end{pmatrix} \quad \begin{pmatrix}1\end{pmatrix}\right)\left(\begin{pmatrix}1 & 2\\ 2 & 0\\ 1 & 0\end{pmatrix} \quad \begin{pmatrix}0\\ 1\\ 2\end{pmatrix}\right)\left(\begin{pmatrix}0\\ 2\\ x\end{pmatrix}\right) = 0$$

$$\implies \left(\begin{pmatrix}1 & 2\end{pmatrix}\begin{pmatrix}1 & 2\\ 2 & 0\end{pmatrix} + \begin{pmatrix}1\end{pmatrix}\begin{pmatrix}1 & 0\end{pmatrix} \quad \begin{pmatrix}1 & 2\end{pmatrix}\begin{pmatrix}0\\ 1\end{pmatrix} + \begin{pmatrix}1\end{pmatrix}\begin{pmatrix}2\end{pmatrix}\right)\left(\begin{pmatrix}0\\ 2\\ x\end{pmatrix}\right) = 0$$

$$\implies \left(\begin{pmatrix}5 & 2\end{pmatrix} + \begin{pmatrix}1 & 0\end{pmatrix} \quad \begin{pmatrix}2+2\end{pmatrix}\right)\left(\begin{pmatrix}0\\ 2\\ x\end{pmatrix}\right) = 0$$

$$\implies \left(\begin{pmatrix}6 & 2\end{pmatrix} \quad \begin{pmatrix}4\end{pmatrix}\right)\left(\begin{pmatrix}0\\ 2\\ x\end{pmatrix}\right) = 0$$

$$\implies \left(\begin{pmatrix}6 & 2\end{pmatrix}\begin{pmatrix}0\\ 2\end{pmatrix} + \begin{pmatrix}4\end{pmatrix}\begin{pmatrix}x\end{pmatrix}\right) = 0$$

$$\implies \begin{pmatrix}4 + 4 \times x\end{pmatrix} = 0$$

$$\implies 4 \times x = -4$$

$$\implies x = -1 \tag{2.2.1}$$