EE5609 Assignment 2

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Abstract—**This assignment involves finding the matrix X by solving the equation.**

The python code solution can be downloaded from,

https://github.com/Vaibhav11002/EE5609/blob/ master/Assignment_2/Codes/assignment_2.py

1 PROBLEM

Find X if $Y = \begin{pmatrix} 3 & 2 \\ 1 & 4 \end{pmatrix}$ and $2X + Y = \begin{pmatrix} 1 & 0 \\ -3 & 2 \end{pmatrix}$.

2 SOLUTION

Let,

$$Y = \begin{pmatrix} 3 & 2 \\ 1 & 4 \end{pmatrix} = M \qquad (2.0.1)$$

$$2X + Y = \begin{pmatrix} 1 & 0 \\ -3 & 2 \end{pmatrix} = N \qquad (2.0.2)$$

Expressing the matrices (2.0.1), (2.0.2) in the vector form,

$$\begin{pmatrix} 0 & I \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix} = M \qquad (2.0.3)$$

$$\begin{pmatrix} 2I & I \end{pmatrix} \begin{pmatrix} X \\ Y \end{pmatrix} = N \qquad (2.0.4)$$

Combining both the equations into a single matrix equation and constructing the augmented matrix,

$$\begin{pmatrix} 0 & I & M \\ 2I & I & N \end{pmatrix} \qquad (2.0.5)$$

Transforming (2.0.5) using row reduction,

$$\begin{pmatrix} 0 & I & M \\ 2I & I & N \end{pmatrix} \xrightarrow{R1 \leftrightarrow R2} \begin{pmatrix} 2I & I & N \\ 0 & I & M \end{pmatrix} \qquad (2.0.6)$$

$$\xrightarrow{R1 \leftarrow R1 - R2} \begin{pmatrix} 2I & 0 & N-M \\ 0 & I & M \end{pmatrix} \xrightarrow{R1 \leftarrow \frac{R1}{2}} \begin{pmatrix} I & 0 & \frac{N-M}{2} \\ 0 & I & M \end{pmatrix} \qquad (2.0.7)$$

From (2.0.7),

$$X = \frac{N - M}{2} = \begin{pmatrix} -1 & -1 \\ -2 & -1 \end{pmatrix} \qquad (2.0.8)$$