Matrix theory Assignment 3

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***Abstract*—This document solves for X and Y matrices based on the properties of matrix addition**

Download all python codes from

https://github.com/saipranavkr/EE5609/codes

and latex-tikz codes from

https://github.com/saipranavkr/EE5609

1 Problem

Find X and Y, if

$$(i) X+Y=\begin{pmatrix}7 & 0\\ 2 & 5\end{pmatrix} \quad and \quad X-Y=\begin{pmatrix}3 & 0\\ 0 & 3\end{pmatrix}$$

$$(ii) 2X+3Y=\begin{pmatrix}2 & 3\\ 4 & 0\end{pmatrix} \quad and \quad 3X+2Y=\begin{pmatrix}2 & -2\\ -1 & 5\end{pmatrix}$$

2 Solution

(i) Given,

$$X+Y=\begin{pmatrix}7 & 0\\ 2 & 5\end{pmatrix} \tag{2.0.1}$$

$$X-Y=\begin{pmatrix}3 & 0\\ 0 & 3\end{pmatrix} \tag{2.0.2}$$

Adding (2.0.1), (2.0.2) and then dividing by 2 on both sides we get,

$$\implies X=\begin{pmatrix}5 & 0\\ 1 & 4\end{pmatrix} \tag{2.0.3}$$

Substituting the value of X in (2.0.1) and solving for Y,

$$\implies Y=\begin{pmatrix}7 & 0\\ 2 & 5\end{pmatrix}-\begin{pmatrix}5 & 0\\ 1 & 4\end{pmatrix}=\begin{pmatrix}2 & 0\\ 1 & 1\end{pmatrix} \tag{2.0.4}$$

(ii) Given,

$$2X+3Y=\begin{pmatrix}2 & 3\\ 4 & 0\end{pmatrix} \tag{2.0.5}$$

$$3X+2Y=\begin{pmatrix}2 & -2\\ -1 & 5\end{pmatrix} \tag{2.0.6}$$

Multiplying (2.0.5) by 3 and (2.0.6) by 2 we get,

$$6X+9Y=\begin{pmatrix}6 & 9\\ 12 & 0\end{pmatrix} \tag{2.0.7}$$

$$6X+4Y=\begin{pmatrix}4 & -4\\ -2 & 10\end{pmatrix} \tag{2.0.8}$$

Subtracting (2.0.8) from (2.0.7), dividing it by 5 and solving it for Y,

$$\implies Y=\begin{pmatrix}\frac{2}{5} & \frac{13}{5}\\ \frac{14}{5} & -2\end{pmatrix} \tag{2.0.9}$$

Substituting the value of Y in (2.0.5) and solving it,

$$\implies 2X=\begin{pmatrix}\frac{4}{5} & \frac{-24}{5}\\ \frac{-22}{5} & 6\end{pmatrix} \tag{2.0.10}$$

Dividing (2.0.10) by 2 we get,

$$X=\begin{pmatrix}\frac{2}{5} & \frac{-12}{5}\\ \frac{-11}{5} & 3\end{pmatrix} \tag{2.0.11}$$