

# AI1110 Assignment 1

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**Question 2(a):** Find  $x, y$  If

$$\begin{pmatrix} -2 & 0 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} -1 \\ 2x \end{pmatrix} + 3 \begin{pmatrix} -2 \\ 1 \end{pmatrix} = 2 \begin{pmatrix} y \\ 3 \end{pmatrix}. \quad (1)$$

**Solution:**

- 1) A matrix having  $m$  rows and  $n$  columns is denoted by  $(m \times n)$ .
- 2) We can multiply two matrices if and only if the matrices are in the form  $(p \times q)$  and  $(q \times r)$  respectively. [where  $p, q, r, m, n$  are arbitrary constants]

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \begin{pmatrix} w & x \\ y & z \end{pmatrix} = \begin{pmatrix} aw + by & ax + bz \\ cw + dy & cx + dz \end{pmatrix} \quad (2)$$

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix} \pm \begin{pmatrix} w & x \\ y & z \end{pmatrix} = \begin{pmatrix} a \pm w & b \pm x \\ c \pm y & d \pm z \end{pmatrix} \quad (3)$$

$$k \begin{pmatrix} a & b \\ c & d \end{pmatrix} = \begin{pmatrix} ka & kb \\ kc & kd \end{pmatrix} \quad (4)$$

converting the given question into  $Ax = b$  form by simplification using equations (2), (3), (4);

$$\begin{pmatrix} 2 \\ 2x - 3 \end{pmatrix} = \begin{pmatrix} 2y \\ 6 \end{pmatrix} - \begin{pmatrix} -6 \\ 3 \end{pmatrix} \quad (5)$$

$$\begin{pmatrix} 2 \\ 2x - 3 \end{pmatrix} = \begin{pmatrix} 2y + 6 \\ 3 \end{pmatrix} \quad (6)$$

$$\begin{pmatrix} 2 \\ 2x - 3 \end{pmatrix} - \begin{pmatrix} 2y + 6 \\ 3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (7)$$

$$\begin{pmatrix} -2y - 4 \\ 2x - 6 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (8)$$

$$\begin{pmatrix} -2y \\ 2x \end{pmatrix} - \begin{pmatrix} 4 \\ 6 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \quad (9)$$

$$\begin{pmatrix} -2y \\ 2x \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} + \begin{pmatrix} 4 \\ 6 \end{pmatrix} \quad (10)$$

$$\begin{pmatrix} -2y \\ 2x \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \end{pmatrix} \quad (11)$$

this can be written as

$$\begin{pmatrix} 0 & -2 \\ 2 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \end{pmatrix} \quad (12)$$

$\therefore$  we got  $Ax = b$  form.