AI1110 Assignment 1

Ravula Karthik(AI21BTECH11024)

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 coloumns is denoted by (m×n) .
2) We can mulitply two matrices if and only if the matrices are in the form (p×q) and (q×r) respectively . [where p,q,r,m,n are arbitrary constants]

(i)

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

(ii)

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

(iii)

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

(i) mulitplying $\begin{pmatrix} -2 & 0 \\ 3 & 1 \end{pmatrix}$ and $\begin{pmatrix} -1 \\ 2x \end{pmatrix}$
from (2);
$\implies$ A = $\begin{pmatrix} 2 \\ 2x - 3 \end{pmatrix}$

(ii) multiplying 3 and $\begin{pmatrix} -2 \\ 1 \end{pmatrix}$
from (2) ;
$\implies$ B = $\begin{pmatrix} -6 \\ 3 \end{pmatrix}$

(iii) mulitplying 2 and $\begin{pmatrix} y \\ 3 \end{pmatrix}$
from (4) ;
$\implies$ C = $\begin{pmatrix} 2y \\ 6 \end{pmatrix}$
from (3) ;
adding A and B ;

$$\begin{pmatrix} 2 \\ 2x - 3 \end{pmatrix} + \begin{pmatrix} -6 \\ 3 \end{pmatrix} = \begin{pmatrix} -4 \\ 2x \end{pmatrix} \quad (5)$$

LHS: $\begin{pmatrix} -4 \\ 2x \end{pmatrix}$
RHS: $\begin{pmatrix} 2y \\ 6 \end{pmatrix}$
comparing LHS and RHS
we get :
-4 = 2y and 2x = 6 ;
we get ;
$x = 3$ $y = -2$
$\therefore$ $x = 3$, $y = -2$.

converting the given question into Ax = b form from question :

$$\begin{pmatrix} 2 \\ 2x-3 \end{pmatrix} = \begin{pmatrix} 2y \\ 6 \end{pmatrix} - \begin{pmatrix} -6 \\ 3 \end{pmatrix} \tag{6}$$

from equation (2) ;

$$\begin{pmatrix} 2 \\ 2x-3 \end{pmatrix} = \begin{pmatrix} 2y+6 \\ 3 \end{pmatrix} \tag{7}$$

$$\begin{pmatrix} 2 \\ 2x-3 \end{pmatrix} - \begin{pmatrix} 2y+6 \\ 3 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{8}$$

from equation (2) ;

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

$$\begin{pmatrix} -2y \\ 2x \end{pmatrix} - \begin{pmatrix} 4 \\ 6 \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} \tag{10}$$

$$\begin{pmatrix} -2y \\ 2x \end{pmatrix} = \begin{pmatrix} 0 \\ 0 \end{pmatrix} + \begin{pmatrix} 4 \\ 6 \end{pmatrix} \tag{11}$$

from equation (2);

$$\begin{pmatrix} -2y \\ 2x \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \end{pmatrix} \tag{12}$$

this can be written as

$$\begin{pmatrix} 0 & -2 \\ 2 & 0 \end{pmatrix} \begin{pmatrix} x \\ y \end{pmatrix} = \begin{pmatrix} 4 \\ 6 \end{pmatrix} \tag{13}$$

$\therefore$ we got Ax = b form.