Assignment I (ICSE CLASS 10 2014)

Homework

Karthik Ravula

AI21BTECH11024

April 3, 2022

PROBLEM 2a : Find x, y If $\begin{bmatrix} -2 & 0 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} -1 \\ 2x \end{bmatrix}$ **LHS** : $\begin{bmatrix} -4 \\ 2x \end{bmatrix}$ and

$+ 3 \begin{bmatrix} -2 \\ 1 \end{bmatrix} = 2 \begin{bmatrix} y \\ 3 \end{bmatrix}$. **RHS** : $\begin{bmatrix} 2y \\ 6 \end{bmatrix}$

comparing **LHS** and **RHS**

we get ;

SOLUTION :

NOTATION : A matrix having m rows and n coloumns is denoted by (m×n) .

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]

we already know ;

-4 = 2y and 2x = 6 ;

we get ;

x = 3 and y = -2

$\therefore x = 3$

$y = -2.$

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} aw + by & ax + bz \\ cw + dy & cx + dz \end{bmatrix} \quad (0.0.1)$$

and,

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \pm \begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} a \pm w & b \pm x \\ c \pm y & d \pm z \end{bmatrix} \quad (0.0.2)$$

and, multiplication of matrix with a scalar

$$k \begin{bmatrix} a & b \\ c & d \end{bmatrix} = \begin{bmatrix} ka & kb \\ kc & kd \end{bmatrix} \quad (0.0.3)$$

mulitplying $\begin{bmatrix} -2 & 0 \\ 3 & 1 \end{bmatrix}$ and $\begin{bmatrix} -1 \\ 2x \end{bmatrix}$

from (1) ;

$\implies$ resultant matrix A: $\begin{bmatrix} (-2 \times -1) + (0 \times 2x) \\ (3 \times -1) + (1 \times 2x) \end{bmatrix}$

$\implies$ A $= \begin{bmatrix} 2 \\ 2x - 3 \end{bmatrix}$

mulitplying 3 and $\begin{bmatrix} -2 \\ 1 \end{bmatrix}$

from (3) ;

$\implies$ resultant matrix B: $\begin{bmatrix} (-2 \times 3) \\ (1 \times 3) \end{bmatrix}$

$\implies$ B $= \begin{bmatrix} -6 \\ 3 \end{bmatrix}$

mulitplying 2 and $\begin{bmatrix} y \\ 3 \end{bmatrix}$

from (3) ;

$\implies$ resultant matrix C: $\begin{bmatrix} (2 \times y) \\ (2 \times 3) \end{bmatrix}$

$\implies$ C $= \begin{bmatrix} 2y \\ 6 \end{bmatrix}$

from (2) ;

adding A and B ; $\begin{bmatrix} 2 \\ 2x - 3 \end{bmatrix} + \begin{bmatrix} -6 \\ 3 \end{bmatrix} = \begin{bmatrix} -4 \\ 2x \end{bmatrix}$

converting the given question into Ax = b form

given question :

$$\begin{bmatrix} -2 & 0 \\ 3 & 1 \end{bmatrix} \begin{bmatrix} -1 \\ 2x \end{bmatrix} + 3 \begin{bmatrix} -2 \\ 1 \end{bmatrix} = 2 \begin{bmatrix} y \\ 3 \end{bmatrix}.$$

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

from equation 0.02 ; $\begin{bmatrix} 2 \\ 2x - 3 \end{bmatrix} = \begin{bmatrix} 2y + 6 \\ 3 \end{bmatrix}$

$$\begin{bmatrix} 2 \\ 2x - 3 \end{bmatrix} - \begin{bmatrix} 2y + 6 \\ 3 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

from equation 0.02 ; $\begin{bmatrix} -2y - 4 \\ 2x - 6 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$

$$\begin{bmatrix} -2y \\ 2x \end{bmatrix} - \begin{bmatrix} 4 \\ 6 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$$

$$\begin{bmatrix} -2y \\ 2x \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix} + \begin{bmatrix} 4 \\ 6 \end{bmatrix}$$

from equation 0.02 ; $\begin{bmatrix} -2y \\ 2x \end{bmatrix} = \begin{bmatrix} 4 \\ 6 \end{bmatrix}$

this can be written as

$$\begin{bmatrix} 0 & -2 \\ 2 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 4 \\ 6 \end{bmatrix}.$$

$\therefore$ we got Ax = b form.