Assignment for class 12

Mathematics

Topic : Determinant (continued)

<mark>**General Direction for students:** whatever the questions solved, everything must be copied in the Maths copy and then do the Homework in the same copy.</mark>

<mark>Example.1.   5x -10y =40 , x-2y =8 ;</mark>

Here , $A=\begin{bmatrix} 5 & -10 \\ 1 & -2 \end{bmatrix}$, $X=\begin{bmatrix} x \\ y \end{bmatrix}$ & $B=\begin{bmatrix} 40 \\ 8 \end{bmatrix}$

$|A|$=-10 +10 =0, and $adj\ A =\begin{bmatrix} -2 & 10 \\ -1 & 5 \end{bmatrix}$

Now, $(adj\ A)\ B =\begin{bmatrix} -2 & 10 \\ -1 & 5 \end{bmatrix}\begin{bmatrix} 40 \\ 8 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$ =O (null matrix)

Thus given system of equations is consistent with infinitely many solutions

 therefore Let   y =k, then 5x -10k =40

$\Rightarrow$ x= $\dfrac{40+10k}{5}=8+2k$

Hence x= $8+2k$, y=k (k is any real number) represents infinitely many solutions

<mark>Example 2: 2x -y +3z=5 , 3x +2y -z =7 , 4x +5y -5z =9 ;</mark>

 Here $A=\begin{bmatrix} 2 & -1 & 3 \\ 3 & 2 & -1 \\ 4 & 5 & -5 \end{bmatrix}$, $X=\begin{bmatrix} x \\ y \\ z \end{bmatrix}$ and B= $\begin{bmatrix} 5 \\ 7 \\ 9 \end{bmatrix}$

Further , $|A|$= 2 (-5) +1 (-11) +3(7) = -10 -11 +21 =0 and $adj\ A=\begin{bmatrix} -5 & 10 & -5 \\ 11 & -22 & 11 \\ 7 & -14 & 7 \end{bmatrix}$

also , $(adj\ A\ )B=\begin{bmatrix} -5 & 10 & -5 \\ 11 & -22 & 11 \\ 7 & -14 & 7 \end{bmatrix}\begin{bmatrix} 5 \\ 7 \\ 9 \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \end{bmatrix}$ =O

to confirm its consistency we select any two equation

Let z=k , Then 2x -y= 5-3k and 3x +2y=7+k

Again, $A = \begin{bmatrix} 2 & -1 \\ 3 & 2 \end{bmatrix}$, $X = \begin{bmatrix} x \\ y \end{bmatrix}$ and $B = \begin{bmatrix} 5 - 3k \\ 7 + k \end{bmatrix}$

we have , $|A| = 7 \neq 0$ and $A^{-1} = \dfrac{1}{7}\begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}$

Now , $X = A^{-1} B$

$$\Rightarrow \begin{bmatrix} x \\ y \end{bmatrix} = \frac{1}{7}\begin{bmatrix} 2 & 1 \\ -3 & 2 \end{bmatrix}\begin{bmatrix} 5 - 3k \\ 7 + k \end{bmatrix} = \frac{1}{7}\begin{bmatrix} 17 - 5k \\ 11k - 1 \end{bmatrix}$$

$\therefore$ $x = \dfrac{17 - 5k}{7}$, $y = \dfrac{11k - 1}{7}$ and z =k,

we need to verify whether these values satisfy third equation4x +5y -5z=9 or not

$\therefore$ 4x +5y -5z = $4(\dfrac{17 - 5k}{7}) + 5(\dfrac{11k - 1}{7})$ -5k= $\dfrac{68 - 20k + 55k - 5 - 35k}{7} = \dfrac{63}{7} = 9$

Finally x= $\dfrac{17 - 5k}{7}$, y= $\dfrac{11k - 1}{7}$ and z =k, where k is any real number

consistent and infinitely many solutions

Homework : Using matrix method solve the following system of equation.

i) x+y+z=6, x +2y +3z =14, x+4y+7z =30

ii)5x +7y =2, 10x +14y =4,

iii) x+y -2z =5 , x -2y +z =-2, -2x +y +z =-3,

iv) 3x -4y =1 , 6x -8y =7