Assignment 9

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***Abstract*—This is a simple document explaining how to express a system of equations by the linear combination of another system of equations.**

Download all and latex-tikz codes from

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svn co https://github.com/gadepall/school/trunk/
    ncert/geometry/figs
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1 Problem

Let $A = \begin{pmatrix} 1 & -1 \\ 2 & 2 \\ 1 & 0 \end{pmatrix}$ and $B = \begin{pmatrix} 3 & 1 \\ -4 & 4 \end{pmatrix}$ Is there any matrix C such that $CA = B$?

2 Explanation

The matrix B is obtained by multiplying the matrix A with matrix C which is nothing but the linear combinations of the rows of matrix A. Now,considering the first row of matrix B:

$$\begin{pmatrix} 3 & 1 \end{pmatrix} = a_1 \begin{pmatrix} 1 & -1 \end{pmatrix} + b_1 \begin{pmatrix} 2 & 2 \end{pmatrix} + c_1 \begin{pmatrix} 1 & 0 \end{pmatrix} \tag{2.0.1}$$

If $a_1 = 1$, $b_1 = 1$ and $c_1 = 0$, then the above equation is satisfied, that is,

$$\begin{pmatrix} 3 & 1 \end{pmatrix} = 1 \begin{pmatrix} 1 & -1 \end{pmatrix} + 1 \begin{pmatrix} 2 & 2 \end{pmatrix} + 0 \begin{pmatrix} 1 & 0 \end{pmatrix} \tag{2.0.2}$$

Similarly, considering the second row of matrix B:

$$\begin{pmatrix} -4 & 4 \end{pmatrix} = a_2 \begin{pmatrix} 1 & -1 \end{pmatrix} + b_2 \begin{pmatrix} 2 & 2 \end{pmatrix} + c_2 \begin{pmatrix} 1 & 0 \end{pmatrix} \tag{2.0.3}$$

If a_2 = -4, $b_2 = 0$ and $c_2 = 0$, then the above equation is satisfied, that is,

$$\begin{pmatrix} 3 & 1 \end{pmatrix} = (-4) \begin{pmatrix} 1 & -1 \end{pmatrix} + 0 \begin{pmatrix} 2 & 2 \end{pmatrix} + 0 \begin{pmatrix} 1 & 0 \end{pmatrix} \tag{2.0.4}$$

So, the matrix C can be written as:

$$C = \begin{pmatrix} 1 & 1 & 0 \\ -4 & 0 & 0 \end{pmatrix} \tag{2.0.5}$$

3 Solution

So, the matrix $C = \begin{pmatrix} 1 & 1 & 0 \\ -4 & 0 & 0 \end{pmatrix}$ such that CA=B.