

Assignment 9

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Abstract—This is a simple document explaining how to express a matrix by the linear combination of the rows of another matrix.

Download all and latex-tikz codes from

svn co <https://github.com/gadepall/school/trunk/ncert/geometry/figs>

3.1. Verification of the above problem using python code.

Solution: The following Python code verifies the above solution.

codes/multiplication_test.py

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 :

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

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

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

Similarly, considering the second row of matrix B :

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

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

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

So, the matrix C can be written as:

$$C = \begin{pmatrix} 1 & 1 & 0 \\ -4 & 0 & 0 \end{pmatrix} \quad (2.0.5)$$

3 SOLUTION

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