

Assignment 9

Jayati Dutta

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>

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 . B is a 2×2 matrix and A is a 3×2 matrix. so matrix C must be a 2×3 matrix. Let the matrix C is:

$$C = \begin{pmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{pmatrix} \quad (2.0.1)$$

$$\Rightarrow C^T = \begin{pmatrix} a_1 & a_2 \\ b_1 & b_2 \\ c_1 & c_2 \end{pmatrix} \quad (2.0.2)$$

So, after multiplying with A matrix we get,

$$\begin{pmatrix} a_1 & b_1 & c_1 \\ a_2 & b_2 & c_2 \end{pmatrix} \begin{pmatrix} 1 & -1 \\ 2 & 2 \\ 1 & 0 \end{pmatrix} = \begin{pmatrix} a_1 + 2b_1 + c_1 & -a_1 + 2b_1 \\ a_2 + 2b_2 + c_2 & -a_2 + 2b_2 \end{pmatrix} \quad (2.0.3)$$

Matrix A is a rectangular matrix. Now, Considering $CA = B$ and by transposing both side,

$$(CA)^T = B^T \quad (2.0.4)$$

$$\Rightarrow A^T C^T = B^T \quad (2.0.5)$$

$$(2.0.6)$$