Assignment 11

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The link to the solution is

https://github.com/Adarsh1310/EE5609

Abstract—**This documents show a method to perform row exchange using elementary row operations.**

1 Problem

Prove that the interchange of two rows of a matrix can be accomplished by a finite sequence of elementary row operations of the other two types.

2 Solution

Let us assume a matrix $\mathbf{M}$ having row vectors as $\mathbf{a}_1$,$\mathbf{a}_2 \cdots \mathbf{a}_n$.

$$\mathbf{M} = \begin{pmatrix} a_1 \\ a_2 \\ \cdots \\ a_n \end{pmatrix} \tag{2.0.1}$$

Let's exchange row $\mathbf{a}_1$ and $\mathbf{a}_2$.

$$\mathbf{M} = \begin{pmatrix} a_2 \\ a_1 \\ \cdots \\ a_n \end{pmatrix} \tag{2.0.2}$$

Now, to prove that same matrix can be obtained by row operations of other two types, we will first add row 1 and row 2.

$$\begin{pmatrix} a_1+\mathbf{a}_2 \\ a_2 \\ \cdots \\ a_n \end{pmatrix} \tag{2.0.3}$$

Now, subtract row 1 from row 2.

$$\mathbf{M} = \begin{pmatrix} a_1+\mathbf{a}_2 \\ -a_1 \\ \cdots \\ a_n \end{pmatrix} \tag{2.0.4}$$

Now adding row 2 to row 1.

$$\mathbf{M} = \begin{pmatrix} a_2 \\ -a_1 \\ \cdots \\ a_n \end{pmatrix} \tag{2.0.5}$$

Now, multiplying row 2 by -1.

$$\mathbf{M} = \begin{pmatrix} a_2 \\ a_1 \\ \cdots \\ \mathbf{a}_n \end{pmatrix} \tag{2.0.6}$$