

# Matrix Theory (EE5609) Assignment 2

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**Abstract**—This document contains the solution to find the inverse of matrix, if it exists

Download all python codes from

[https://github.com/utkarshsurwade/  
Matrix\\_Theory\\_EE5609/tree/master/codes](https://github.com/utkarshsurwade/Matrix_Theory_EE5609/tree/master/codes)

and latex-tikz codes from

[https://github.com/utkarshsurwade/  
Matrix\\_Theory\\_EE5609/tree/master/  
Assignment2](https://github.com/utkarshsurwade/Matrix_Theory_EE5609/tree/master/Assignment2)

Applying elementary transformations on  $\mathbf{A}$  as follows:

$$\begin{array}{l} \xleftrightarrow{R_2 \leftarrow R_2 + 3R_1} \\ \xleftrightarrow{R_3 \leftarrow R_3 - 2R_1} \end{array} \left( \begin{array}{ccc|ccc} 1 & 3 & -2 & 1 & 0 & 0 \\ 0 & 9 & -11 & 3 & 1 & 0 \\ 0 & -1 & 4 & -2 & 0 & 1 \end{array} \right) \quad (2.0.3)$$

$$\begin{array}{l} \xleftrightarrow{R_2 \leftrightarrow -R_3} \\ \xleftrightarrow{R_1 \leftarrow R_1 - 3R_2} \end{array} \left( \begin{array}{ccc|ccc} 1 & 0 & 10 & -5 & 0 & 3 \\ 0 & 1 & -4 & 2 & 0 & -1 \\ 0 & 9 & -11 & 3 & 1 & 0 \end{array} \right) \quad (2.0.4)$$

$$\begin{array}{l} \xleftrightarrow{R_3 \leftarrow R_3 - 4R_2} \\ \xleftrightarrow{R_3 \leftarrow \frac{R_3}{25}} \end{array} \left( \begin{array}{ccc|ccc} 1 & 0 & 10 & -5 & 0 & 3 \\ 0 & 1 & -4 & 2 & 0 & -1 \\ 0 & 0 & 1 & \frac{-3}{5} & \frac{1}{25} & \frac{9}{25} \end{array} \right) \quad (2.0.5)$$

$$\begin{array}{l} \xleftrightarrow{R_1 \leftarrow R_1 - 10R_3} \\ \xleftrightarrow{R_2 \leftarrow R_2 + 4R_3} \end{array} \left( \begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & \frac{-2}{5} & \frac{-3}{5} \\ 0 & 1 & 0 & \frac{-2}{5} & \frac{4}{25} & \frac{11}{25} \\ 0 & 0 & 1 & \frac{-3}{5} & \frac{1}{25} & \frac{9}{25} \end{array} \right) \quad (2.0.6)$$

Therefore  $\mathbf{A}^{-1}$  is as follows:

$$\left( \begin{array}{ccc} 1 & \frac{-2}{5} & \frac{-3}{5} \\ \frac{-2}{5} & \frac{4}{25} & \frac{11}{25} \\ \frac{-3}{5} & \frac{1}{25} & \frac{9}{25} \end{array} \right) \quad (2.0.7)$$

## 1 PROBLEM

Using elementary transformations, find the inverse of the matrix, if it exists

$$\left( \begin{array}{ccc} 1 & 3 & -2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{array} \right) \quad (1.0.1)$$

## 2 SOLUTION

$$\text{Let } \mathbf{A} = \left( \begin{array}{ccc} 1 & 3 & -2 \\ -3 & 0 & -5 \\ 2 & 5 & 0 \end{array} \right) \quad (2.0.1)$$

Therefore the augmented matrix can be represented as follows :

$$\left( \begin{array}{ccc|ccc} 1 & 3 & -2 & 1 & 0 & 0 \\ -3 & 0 & -5 & 0 & 1 & 0 \\ 2 & 5 & 0 & 0 & 0 & 1 \end{array} \right) \quad (2.0.2)$$