

5.4.8

EE25BTECH11013 - Bhargav

Question:

Using elementary transformations, find the inverse of the following matrix

$$\begin{pmatrix} -1 & 5 \\ -3 & 2 \end{pmatrix}$$

Solution:

We know that

$$\mathbf{A}^{-1}\mathbf{A} = \mathbf{I} \quad (0.1)$$

where \mathbf{I} is the 2×2 identity matrix

Now we get the augmented matrix

$$\left(\begin{array}{cc|cc} -1 & 5 & 1 & 0 \\ -3 & 2 & 0 & 1 \end{array} \right) \xrightarrow[R_2 \leftarrow R_2 + 3R_1]{R_1 \leftarrow -R_1} \left(\begin{array}{cc|cc} 1 & -5 & -1 & 0 \\ 0 & -13 & -3 & 1 \end{array} \right) \quad (0.2)$$

$$\xrightarrow[R_1 \leftarrow R_1 + 5R_2]{R_2 \leftarrow -\frac{1}{13}R_2} \left(\begin{array}{cc|cc} 1 & 0 & \frac{2}{13} & -\frac{5}{13} \\ 0 & 1 & \frac{3}{13} & -\frac{1}{13} \end{array} \right) \quad (0.3)$$

Therefore

$$\mathbf{A}^{-1} = \frac{1}{13} \begin{pmatrix} 2 & -5 \\ 3 & -1 \end{pmatrix} \quad (0.4)$$

This can be verified from the code by showing that $\mathbf{A}^{-1}\mathbf{A} = \mathbf{I}$