

# EE5609: Matrix Theory

## Assignment-1

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**Abstract**—This document contains a solution for a pair of given linear equations.

Download the python codes from

<https://github.com/pranaya14014/EE5609/tree/master/Assignment1/code>

and latex-tikz codes from

<https://github.com/pranaya14014/EE5609/blob/master/Assignment1>

Hence the solution is:  $\begin{pmatrix} -2 \\ 5 \end{pmatrix}$

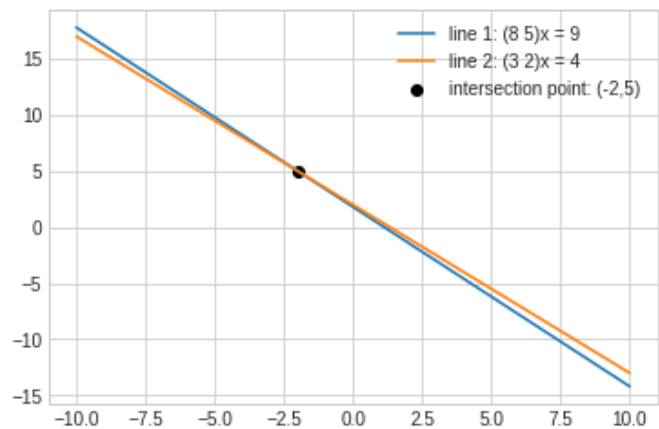


Fig. 0: Linear equations plot generated using python

### 1 PROBLEM

Solve the following pair of linear equations

$$\begin{pmatrix} 8 & 5 \end{pmatrix} \mathbf{x} = 9 \quad (1.0.1)$$

$$\begin{pmatrix} 3 & 2 \end{pmatrix} \mathbf{x} = 4 \quad (1.0.2)$$

### 2 SOLUTION

Step 1: Construct the Augmented Matrix

$$\begin{pmatrix} 8 & 5 & 9 \\ 3 & 2 & 4 \end{pmatrix} \quad (2.0.1)$$

Step 2: Perform row operations to get a Row Echelon form

$$\begin{pmatrix} 8 & 5 & 9 \\ 3 & 2 & 4 \end{pmatrix} \xrightarrow{R2 \rightarrow 8R2 - 3R1} \begin{pmatrix} 8 & 5 & 9 \\ 0 & 1 & 5 \end{pmatrix} \quad (2.0.2)$$

$$\begin{pmatrix} 8 & 5 & 9 \\ 0 & 1 & 5 \end{pmatrix} \xrightarrow{R1 \rightarrow R1 - 5R2} \begin{pmatrix} 8 & 0 & -16 \\ 0 & 1 & 5 \end{pmatrix} \quad (2.0.3)$$

$$\begin{pmatrix} 8 & 0 & -16 \\ 0 & 1 & 5 \end{pmatrix} \xrightarrow{R1 \rightarrow \frac{R1}{8}} \begin{pmatrix} 1 & 0 & -2 \\ 0 & 1 & 5 \end{pmatrix} \quad (2.0.4)$$

Above final matrix is in the reduced Echelon form and from this matrix we get the solution. Last column represents the solution of the given linear equation.