5.2.7

Aditya Appana - EE25BTECH11004

September 20,2025

Question

Solve the following system of linear equations.

$$\frac{3}{2}x + \frac{5}{3}y = 7$$

$$9x - 10y = 14$$

Solution

Organizing the given equations into an augmented matrix:

$$\begin{pmatrix} \frac{3}{2} & \frac{5}{3} & 7 \\ 9 & -10 & 14 \end{pmatrix} \tag{1}$$

Performing row operations:

$$\begin{pmatrix} \frac{3}{2} & \frac{5}{3} & 7 \\ 9 & -10 & 14 \end{pmatrix} \xrightarrow{R_2 \to R_2 - 6R_1} \tag{2}$$

$$\begin{pmatrix} \frac{3}{2} & \frac{5}{3} & 7 \\ 0 & -20 & -28 \end{pmatrix} \xrightarrow{R_1 \to R_1 + \frac{1}{12}R_2} \tag{3}$$

$$\begin{pmatrix} \frac{3}{2} & 0 & \frac{14}{3} \\ 0 & -20 & -28 \end{pmatrix} \tag{4}$$

Solving, we get the solution as:

$$\mathbf{x} = \begin{pmatrix} \frac{28}{9} \\ \frac{7}{5} \end{pmatrix} \tag{5}$$

Python Code

```
import numpy as np
import numpy.linalg
import matplotlib.pyplot as plt

answer = numpy.linalg.solve([[3/2, 5/3],[9,-10]], [7,14])

answer[0] = round(answer[0],2)
answer[1] = round(answer[1],2)
print(answer)
```

Python Code

```
fig = plt.figure(figsize =(6,6))
ax = fig.add_subplot(111)

X = np.linspace(-20,20,2)

Y1 = -0.6*(1.5*X-7)
Y2 = 0.1*(9*X-14)

ax.plot(X, Y1, label='Line 1')
ax.plot(X, Y2, label='Line 2')
ax.scatter(answer[0], answer[1], label=f'({answer[0]}, {answer
    [1]})')
ax.grid(True)
ax.legend()
plt.show()
```

Plot