

## 5.3.38

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September 27,2025

# Question

Find the value of  $x$ , if

$$3x + y = 1$$

$$2y - x = -5$$



Organizing the given equations into an augmented matrix:

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

Performing row operations:

$$\begin{pmatrix} 3 & 1 & 1 \\ -1 & 2 & -5 \end{pmatrix} \xrightarrow{R_1 \rightarrow R_1 - \frac{1}{2}R_2} \begin{pmatrix} \frac{7}{2} & 0 & \frac{7}{2} \\ -1 & 2 & -5 \end{pmatrix} \quad (2)$$

$$\begin{pmatrix} \frac{7}{2} & 0 & \frac{7}{2} \\ -1 & 2 & -5 \end{pmatrix} \xrightarrow{R_2 \rightarrow R_2 + \frac{2}{7}R_1} \begin{pmatrix} \frac{7}{2} & 0 & \frac{7}{2} \\ 0 & 2 & -4 \end{pmatrix} \quad (3)$$

$$\begin{pmatrix} \frac{7}{2} & 0 & \frac{7}{2} \\ 0 & 2 & -4 \end{pmatrix} \xrightarrow{R_2 \rightarrow R_2/2} \begin{pmatrix} \frac{7}{2} & 0 & \frac{7}{2} \\ 0 & 1 & -2 \end{pmatrix} \quad (4)$$

$$\begin{pmatrix} \frac{7}{2} & 0 & \frac{7}{2} \\ 0 & 1 & -2 \end{pmatrix} \xrightarrow{R_1 \rightarrow 2/7 R_1} \begin{pmatrix} 1 & 0 & 1 \\ 0 & 1 & -2 \end{pmatrix} \quad (5)$$

$$x = 1, y = -2$$

# Python Code

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

answer = numpy.linalg.solve([[3,1],[-1,2]], [1,-5])

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 = (1-3*X)
Y2 = 0.5*(X-5)

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

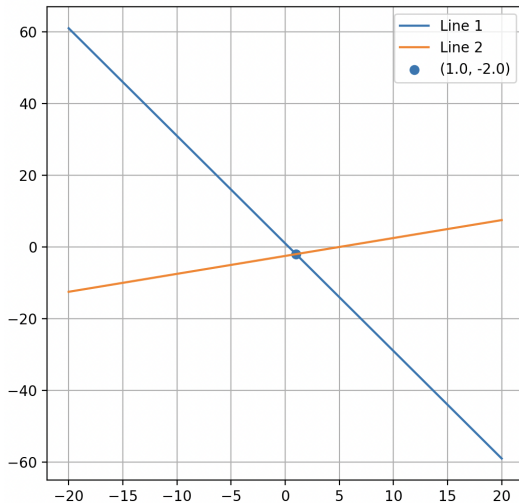


Figure: Plot