The Procedure for Coding the Gaussian Elimination Method for Solving a Set of Equations, Consider two equations:

\[ \begin{align*}
Ax + By + C &= 0 \\
Dx + Ey + F &= 0
\end{align*} \]

Gaussian Elimination says to subtract multiples of the equations, without affecting the final solutions for \( x \) and \( y \). Thus, we set

\[ \begin{align*}
(1) \quad &Ax + By + C = 0 \\
(2) \quad &Dx + Ey + F = 0
\end{align*} \]

If we multiply \( \begin{align*}
(1) \quad &Ax + By + C = 0 \\
(2) \quad &Dx + Ey + F = 0
\end{align*} \) by \( \frac{A}{E} \), we get

\[ \begin{align*}
(1') \quad &A'x + B'y + C' = 0 \\
(2') \quad &D'x + E'y + F' = 0
\end{align*} \]

Now subtract \( \begin{align*}
(2') \quad &D'x + E'y + F' = 0
(2) \quad &Dx + Ey + F = 0
\end{align*} \) yielding

\[ \begin{align*}
(1'') \quad &A''x + B''y + C'' = 0
\end{align*} \]

Thus, \( x = \frac{C}{A'} \) and \( y = \frac{C'}{B'} \).
For 3x3,

\[ Ax + By + Cz + J = 0 \]
\[ Dy + Ey + Fz + K = 0 \leftarrow \text{mult. by} \frac{A}{D} \text{ to eliminate} D \]
\[ Gy + Hy + Iz + L = 0 \leftarrow \text{mult. by} \frac{A}{G} \text{ to eliminate} G \]

Creating modified equations:

#1  \[ Ax + By + Cz + J = 0 \]
#2  \[ Ey + Fz + K = 0 \]
#3  \[ Hy + Iz + L = 0 \]

Now, repeat the process for the two equations

#2' \[ Ey' + Fz' + K' = 0 \]
#3' \[ Hy' + Iz' + L' = 0 \]

And eliminate Hy', so

#2'' \[ Ey'' + Fz'' + K'' = 0 \]
#3'' \[ Iz'' + L'' = 0 \]

Now, \[ I_2'' = -L'' \]

So, from (\#3'')

\[ \beta = -\frac{L''}{I''} \]

Now, use backward substitution

Insert known \( z \) into (#2) to compute \( y \).

The insert known \( z \) and \( y \) into (#2)

to compute \( x \).
Your Problem

1. \( 4x_1 - 2x_2 - 3x_3 - 4 = 0 \)
2. \( 5x_1 + 6x_2 + 7x_3 - 8 = 0 \)
3. \( 9x_1 + 10x_2 + 11x_3 - 12 = 0 \)

\[ \text{Check} \]

\[ 5x_1 + 6x_2 + 7x_3 - 8 = 0 \]

\[ 9x_1 + 10x_2 + 11x_3 - 12 = 0 \]

\[ x_1 = \frac{-5 + 6 - 7}{2} = -1 \]

\[ x_2 = \frac{5 + 7 - 8}{6} = \frac{1}{3} \]

\[ x_3 = \frac{9 + 10 + 11}{7} = 3 \]

\[ x_1 = -1, \quad x_2 = \frac{1}{3}, \quad x_3 = 3 \]

\[ x_1 = \frac{5x_1 + 6x_2 + 7x_3 - 8}{2} = 0 \]

\[ x_2 = \frac{10x_1 + 11x_2 + 12}{6} = 2 \]

\[ x_3 = \frac{9x_1 + 11x_2 + 12}{7} = 3 \]

\[ x_1 = -1, \quad x_2 = 2, \quad x_3 = 3 \]

Now, put all this together.