Solve the following system via Gaussian elimination method.

$$\begin{cases} a + 2b + 3c = 5 \\ 3a - b + 2c = 8 \\ 4a - 6b - 4c = -2 \end{cases}$$

The augmented matrix is

$$\begin{pmatrix} 1 & 2 & 3 & |\,5 \\ 3 & -1 & 2 & |\,8 \\ 4 & -6 & -4 & |\,-2 \end{pmatrix}$$

We use elementary row operations to transform this matrix into a triangular one. We keep the first row and use it to produce all zeros elsewhere in the first column. We have

$$\begin{pmatrix} 1 & 2 & 3 & |\,5 \\ 0 & 7 & 7 & |\,7 \\ 0 & 14 & 16 & |22 \end{pmatrix}$$

Next we keep the first and second row and try to have zeros in the second column. And so on. We have

$$\begin{pmatrix} 1 & 2 & 3 & |\,5 \\ 0 & 1 & 1 & |\,1 \\ 0 & 0 & 2 & |\,8 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 2 & 0 & |\,-7 \\ 0 & 1 & 0 & |\,-3 \\ 0 & 0 & 1 & |\,4 \end{pmatrix}$$

$$\begin{pmatrix} 1 & 0 & 0 & |\,-1 \\ 0 & 1 & 0 & |\,-3 \\ 0 & 0 & 1 & |\,4 \end{pmatrix}$$

So, $a = -1,\ \ b = -3,\ \ c = 4$

Answer: (D) -1.