Step-1

We have to multiply the matrices $E^{-1}F^{-1}G^{-1}$ and GFE, and then we have to multiply the following matrices:

$$\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & -1 & 1 \end{pmatrix}\begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ -1 & 1 & 1 \end{pmatrix}$$

Step-2

Now

$$\begin{aligned}
&\left(E^{-1}F^{-1}G^{-1}\right)(GFE) = E^{-1}F^{-1}\left(G^{-1}G\right)FE \\
&= E^{-1}F^{-1}(I)FE \\
&= E^{-1}F^{-1}(IF)E \\
&= E^{-1}\left(F^{-1}F\right)E
\end{aligned}$$

Step-3

$$\begin{aligned}
&= E^{-1}(I)E \\
&= E^{-1}(IE) \\
&= E^{-1}E \\
&= I
\end{aligned}$$

Step-4

Since I is identity matrices and by associative law, similarly

$$\begin{aligned}
&(GFE)\left(E^{-1}F^{-1}G^{-1}\right) = GF\left(E^{-1}E\right)F^{-1}G^{-1} \\
&= GF(I)F^{-1}G^{-1} \\
&= G(FI)F^{-1}G^{-1}
\end{aligned}$$

Step-5

$$\begin{aligned}
&= G(F)F^{-1}G^{-1} \\
&= G\left(FF^{-1}\right)G^{-1} \\
&= GG^{-1} \\
&= I
\end{aligned}$$

Therefore the matrices $E^{-1}F^{-1}G^{-1}$ and GFE are inverses to each other.

Step-6

And

$$\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & -1 & 1 \end{pmatrix}\begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ -1 & 1 & 1 \end{pmatrix}$$
$$= \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$
$$= I$$

Step-7

$$\begin{pmatrix} 1 & 0 & 0 \\ -2 & 1 & 0 \\ -1 & 1 & 1 \end{pmatrix}\begin{pmatrix} 1 & 0 & 0 \\ 2 & 1 & 0 \\ -1 & -1 & 1 \end{pmatrix}$$
$$= \begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$$
$$= I$$

Therefore the matrices in the above are inverse to each other.