$$\begin{pmatrix} 1 & 2 & 3 \\ 2 & 1 & 2 \end{pmatrix} \cdot \begin{pmatrix} 2 & 3 \\ 1 & 2 \\ 3 & 2 \end{pmatrix} = \begin{pmatrix} 1\times2+2\times1+3\times3 & 1\times3+2\times2+3\times2 \\ 2\times2+1\times1+2\times3 & 3\times2+2\times1+2\times2 \end{pmatrix} = \begin{pmatrix} 13 & 13 \\ 11 & 12 \end{pmatrix}$$

A

$$\left(\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 2 & 1 & 0 & 1 \end{array}\right) \quad -2(I) \rightarrow \left(\begin{array}{cc|cc} 1 & 2 & 1 & 0 \\ 0 & -3 & -2 & 1 \end{array}\right) \quad 3(I),\ 2(II) \rightarrow \left(\begin{array}{cc|cc} 3 & 6 & 3 & 0 \\ 0 & -6 & -4 & 2 \end{array}\right) \quad (I)+(II) \rightarrow$$

$$\left(\begin{array}{cc|cc} 3 & 0 & -1 & 2 \\ 0 & -6 & -4 & 2 \end{array}\right) \quad 1/3(I) \quad -1/6(II) \quad \begin{pmatrix} 1 & 0 & -1/3 & 2/3 \\ 0 & 1 & 2/3 & -1/3 \end{pmatrix} \quad -1/3 \begin{pmatrix} 1 & -2 \\ -2 & 1 \end{pmatrix} = A^{-1}$$

$$-1/3 \begin{pmatrix} 1 & 2 \\ 2 & 1 \end{pmatrix} \begin{pmatrix} 1 & -2 \\ -2 & 1 \end{pmatrix} = -1/3 \begin{matrix} 1-4 & 2-2 \\ 2-2 & -4+1 \end{matrix} = -1/3 \begin{pmatrix} -3 & 0 \\ 0 & -3 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & 1 \end{pmatrix}$$