

$$\textcircled{1} \begin{pmatrix} 2 & -1 & -1 & 1 & -2 \\ -1 & 1 & 2 & 2 & -5 \\ 3 & 1 & -1 & -3 & 8 \\ 2 & 2 & -2 & -1 & 6 \end{pmatrix} \xrightarrow{R_1 \leftrightarrow R_2} \begin{pmatrix} -1 & 1 & 2 & 2 & -5 \\ 2 & -1 & -1 & 1 & -2 \\ 3 & 1 & -1 & -3 & 8 \\ 2 & 2 & -2 & -1 & 6 \end{pmatrix}$$

 $\downarrow R_1 (-1)$

$$\begin{pmatrix} 1 & -1 & -2 & -2 & 5 \\ 0 & 1 & 3 & 5 & -12 \\ 0 & 4 & 5 & 2 & -7 \\ 0 & 4 & 2 & 3 & -4 \end{pmatrix} \xrightarrow{\begin{matrix} R_2 - 2R_1 \\ R_3 - 3R_1 \\ R_4 - 2R_1 \end{matrix}} \begin{pmatrix} 1 & -1 & -2 & -2 & 5 \\ 2 & -1 & -1 & 1 & -2 \\ 3 & 1 & -1 & -3 & 8 \\ 2 & 2 & -2 & -1 & 6 \end{pmatrix}$$

 $\downarrow \begin{matrix} R_3 - 4R_2 \\ R_4 - 4R_2 \end{matrix}$

$$\begin{pmatrix} 1 & -1 & -2 & -2 & 5 \\ 0 & 1 & 3 & 5 & -12 \\ 0 & 0 & -7 & -18 & 41 \\ 0 & 0 & -10 & -17 & 44 \end{pmatrix} \xrightarrow{R_3 / (-7)} \begin{pmatrix} 1 & -1 & -2 & -2 & 5 \\ 0 & 1 & 3 & 5 & -12 \\ 0 & 0 & 1 & 18/7 & -41/7 \\ 0 & 0 & -10 & -17 & 44 \end{pmatrix}$$

 $\downarrow R_4 + 10R_3$

$$\begin{pmatrix} 1 & -1 & -2 & -2 & 5 \\ 0 & 1 & 3 & 5 & -12 \\ 0 & 0 & 1 & 18/7 & -41/7 \\ 0 & 0 & 0 & 1 & -102/61 \end{pmatrix} \xleftarrow{R_4 \left(\frac{7}{61} \right)} \begin{pmatrix} 1 & -1 & -2 & -2 & 5 \\ 0 & 1 & 3 & 5 & -12 \\ 0 & 0 & 1 & 18/7 & -41/7 \\ 0 & 0 & 0 & 61/7 & -102/7 \end{pmatrix}$$

 $\downarrow R_1 + R_2$

$$\begin{pmatrix} 1 & 0 & 1 & 3 & -7 \\ 0 & 1 & 3 & 5 & -12 \\ 0 & 0 & 1 & 18/7 & -41/7 \\ 0 & 0 & 0 & 1 & -102/61 \end{pmatrix} \xrightarrow{\begin{matrix} R_1 - R_3 \\ R_2 - 3R_3 \end{matrix}} \begin{pmatrix} 1 & 0 & 0 & 3/7 & -8/7 \\ 0 & 1 & 0 & -19/7 & 39/7 \\ 0 & 0 & 1 & 18/7 & -41/7 \\ 0 & 0 & 0 & 1 & -102/61 \end{pmatrix}$$

 $\begin{matrix} R_3 - \frac{18}{7} R_4 \\ R_1 - \frac{3}{7} R_4 \\ R_2 + \frac{19}{7} R_4 \end{matrix} \downarrow$

$$\begin{pmatrix} 1 & 0 & 0 & 0 & -26/61 \\ 0 & 1 & 0 & 0 & 63/61 \\ 0 & 0 & 1 & 0 & -99/61 \\ 0 & 0 & 0 & 1 & -102/61 \end{pmatrix}$$

$$\therefore u_1 = -\frac{26}{61}$$

$$u_2 = \frac{63}{61}$$

$$u_3 = -\frac{99}{61}$$

$$u_4 = -\frac{102}{61}$$