

$$\begin{pmatrix} -1 & 1 & -1 & 1 \\ 8 & -7 & 6 & -3 \\ -5 & 5 & -6 & 7 \end{pmatrix}$$

$$\begin{aligned} & \xrightarrow{\text{line1} \times (-1)} \begin{pmatrix} 1 & -1 & 1 & -1 \\ 8 & -7 & 6 & -3 \\ -5 & 5 & -6 & 7 \end{pmatrix} \xrightarrow{\text{line2} -= \text{line1} \times (8)} \begin{pmatrix} 1 & -1 & 1 & -1 \\ 0 & 1 & -2 & 5 \\ -5 & 5 & -6 & 7 \end{pmatrix} \\ & \xrightarrow{\text{line3} += \text{line1} \times (5)} \begin{pmatrix} 1 & -1 & 1 & -1 \\ 0 & 1 & -2 & 5 \\ 0 & 0 & -1 & 2 \end{pmatrix} \xrightarrow{\text{line1} += \text{line2}} \begin{pmatrix} 1 & 0 & -1 & 4 \\ 0 & 1 & -2 & 5 \\ 0 & 0 & -1 & 2 \end{pmatrix} \\ & \xrightarrow{\text{line3} \times (-1)} \begin{pmatrix} 1 & 0 & -1 & 4 \\ 0 & 1 & -2 & 5 \\ 0 & 0 & 1 & -2 \end{pmatrix} \xrightarrow{\text{line1} += \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & -2 & 5 \\ 0 & 0 & 1 & -2 \end{pmatrix} \\ & \xrightarrow{\text{line2} += \text{line3} \times (2)} \begin{pmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & -2 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 1 & -2 & -1 & -2 \\ -2 & 4 & 1 & 2 \\ -3 & 5 & 3 & 7 \end{pmatrix}$$

$$\begin{aligned} & \xrightarrow{\text{line2} += \text{line1} \times (2)} \begin{pmatrix} 1 & -2 & -1 & -2 \\ 0 & 0 & -1 & -2 \\ -3 & 5 & 3 & 7 \end{pmatrix} \xrightarrow{\text{line3} += \text{line1} \times (3)} \begin{pmatrix} 1 & -2 & -1 & -2 \\ 0 & 0 & -1 & -2 \\ 0 & -1 & 0 & 1 \end{pmatrix} \\ & \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -2 & -1 & -2 \\ 0 & -1 & 0 & 1 \\ 0 & 0 & -1 & -2 \end{pmatrix} \xrightarrow{\text{line2} \times (-1)} \begin{pmatrix} 1 & -2 & -1 & -2 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & -1 & -2 \end{pmatrix} \\ & \xrightarrow{\text{line1} += \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & -1 & -4 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & -1 & -2 \end{pmatrix} \xrightarrow{\text{line3} \times (-1)} \begin{pmatrix} 1 & 0 & -1 & -4 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{pmatrix} \\ & \xrightarrow{\text{line1} += \text{line3}} \begin{pmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 1 & -1 & 2 & -6 \\ -1 & 3 & -5 & 9 \\ 2 & 1 & -1 & -7 \end{pmatrix}$$

$$\begin{aligned} & \xrightarrow{\text{line2} += \text{line1}} \begin{pmatrix} 1 & -1 & 2 & -6 \\ 0 & 2 & -3 & 3 \\ 2 & 1 & -1 & -7 \end{pmatrix} \xrightarrow{\text{line3} -= \text{line1} \times (2)} \begin{pmatrix} 1 & -1 & 2 & -6 \\ 0 & 2 & -3 & 3 \\ 0 & 3 & -5 & 5 \end{pmatrix} \\ & \xrightarrow{\text{line3} -= \text{line2}} \begin{pmatrix} 1 & -1 & 2 & -6 \\ 0 & 2 & -3 & 3 \\ 0 & 1 & -2 & 2 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -1 & 2 & -6 \\ 0 & 1 & -2 & 2 \\ 0 & 2 & -3 & 3 \end{pmatrix} \\ & \xrightarrow{\text{line1} += \text{line2}} \begin{pmatrix} 1 & 0 & 0 & -4 \\ 0 & 1 & -2 & 2 \\ 0 & 2 & -3 & 3 \end{pmatrix} \xrightarrow{\text{line3} -= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 0 & -4 \\ 0 & 1 & -2 & 2 \\ 0 & 0 & 1 & -1 \end{pmatrix} \\ & \xrightarrow{\text{line2} += \text{line3} \times (2)} \begin{pmatrix} 1 & 0 & 0 & -4 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -1 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} -7 & -1 & -2 & 5 \\ -6 & -1 & -2 & 5 \\ 4 & 1 & 3 & -7 \end{pmatrix}$$

$$\begin{aligned} &\xrightarrow{\text{line2} \leftarrow \text{line1}} \begin{pmatrix} -7 & -1 & -2 & 5 \\ 1 & 0 & 0 & 0 \\ 4 & 1 & 3 & -7 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & 0 & 0 & 0 \\ -7 & -1 & -2 & 5 \\ 4 & 1 & 3 & -7 \end{pmatrix} \\ &\xrightarrow{\text{line2} += \text{line1} \times (7)} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & -2 & 5 \\ 4 & 1 & 3 & -7 \end{pmatrix} \xrightarrow{\text{line3} \leftarrow \text{line1} \times (4)} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & -1 & -2 & 5 \\ 0 & 1 & 3 & -7 \end{pmatrix} \\ &\xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 3 & -7 \\ 0 & -1 & -2 & 5 \end{pmatrix} \xrightarrow{\text{line3} += \text{line2}} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 3 & -7 \\ 0 & 0 & 1 & -2 \end{pmatrix} \\ &\xrightarrow{\text{line2} \leftarrow \text{line3} \times (3)} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & -2 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 1 & 6 & 3 & 5 \\ -2 & -9 & -5 & -8 \\ -3 & 1 & -3 & -3 \end{pmatrix}$$

$$\begin{aligned} &\xrightarrow{\text{line2} += \text{line1} \times (2)} \begin{pmatrix} 1 & 6 & 3 & 5 \\ 0 & 3 & 1 & 2 \\ -3 & 1 & -3 & -3 \end{pmatrix} \xrightarrow{\text{line3} += \text{line1} \times (3)} \begin{pmatrix} 1 & 6 & 3 & 5 \\ 0 & 3 & 1 & 2 \\ 0 & 19 & 6 & 12 \end{pmatrix} \\ &\xrightarrow{\text{line3} \leftarrow \text{line2} \times (6)} \begin{pmatrix} 1 & 6 & 3 & 5 \\ 0 & 3 & 1 & 2 \\ 0 & 1 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 6 & 3 & 5 \\ 0 & 1 & 0 & 0 \\ 0 & 3 & 1 & 2 \end{pmatrix} \\ &\xrightarrow{\text{line1} \leftarrow \text{line2} \times (6)} \begin{pmatrix} 1 & 0 & 3 & 5 \\ 0 & 1 & 0 & 0 \\ 0 & 3 & 1 & 2 \end{pmatrix} \xrightarrow{\text{line3} \leftarrow \text{line2} \times (3)} \begin{pmatrix} 1 & 0 & 3 & 5 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 \end{pmatrix} \\ &\xrightarrow{\text{line1} \leftarrow \text{line3} \times (3)} \begin{pmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 1 & -2 & 1 & -7 \\ -6 & -1 & 1 & -3 \\ 2 & -2 & 1 & -7 \end{pmatrix}$$

$$\begin{aligned} &\xrightarrow{\text{line2} += \text{line1} \times (6)} \begin{pmatrix} 1 & -2 & 1 & -7 \\ 0 & -13 & 7 & -45 \\ 2 & -2 & 1 & -7 \end{pmatrix} \xrightarrow{\text{line3} \leftarrow \text{line1} \times (2)} \begin{pmatrix} 1 & -2 & 1 & -7 \\ 0 & -13 & 7 & -45 \\ 0 & 2 & -1 & 7 \end{pmatrix} \\ &\xrightarrow{\text{line2} += \text{line3} \times (7)} \begin{pmatrix} 1 & -2 & 1 & -7 \\ 0 & 1 & 0 & 4 \\ 0 & 2 & -1 & 7 \end{pmatrix} \xrightarrow{\text{line1} += \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 4 \\ 0 & 2 & -1 & 7 \end{pmatrix} \\ &\xrightarrow{\text{line3} \leftarrow \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & -1 & -1 \end{pmatrix} \xrightarrow{\text{line3} \times (-1)} \begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 1 \end{pmatrix} \\ &\xrightarrow{\text{line1} \leftarrow \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 4 \\ 0 & 0 & 1 & 1 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 1 & 2 & 2 & -6 \\ 3 & 7 & 3 & -5 \\ 3 & 7 & 2 & -1 \end{pmatrix}$$

$$\begin{aligned} & \xrightarrow{\text{line2} \text{ -= line1} \times (3)} \begin{pmatrix} 1 & 2 & 2 & -6 \\ 0 & 1 & -3 & 13 \\ 3 & 7 & 2 & -1 \end{pmatrix} \xrightarrow{\text{line3} \text{ -= line1} \times (3)} \begin{pmatrix} 1 & 2 & 2 & -6 \\ 0 & 1 & -3 & 13 \\ 0 & 1 & -4 & 17 \end{pmatrix} \\ & \xrightarrow{\text{line1} \text{ -= line2} \times (2)} \begin{pmatrix} 1 & 0 & 8 & -32 \\ 0 & 1 & -3 & 13 \\ 0 & 1 & -4 & 17 \end{pmatrix} \xrightarrow{\text{line3} \text{ -= line2}} \begin{pmatrix} 1 & 0 & 8 & -32 \\ 0 & 1 & -3 & 13 \\ 0 & 0 & -1 & 4 \end{pmatrix} \\ & \xrightarrow{\text{line3} \times (-1)} \begin{pmatrix} 1 & 0 & 8 & -32 \\ 0 & 1 & -3 & 13 \\ 0 & 0 & 1 & -4 \end{pmatrix} \xrightarrow{\text{line1} \text{ -= line3} \times (8)} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & -3 & 13 \\ 0 & 0 & 1 & -4 \end{pmatrix} \\ & \xrightarrow{\text{line2} \text{ += line3} \times (3)} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 \\ 0 & 0 & 1 & -4 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 1 & 1 & -2 & -3 \\ -6 & 2 & 3 & 0 \\ 8 & 1 & -8 & -8 \end{pmatrix}$$

$$\begin{aligned} & \xrightarrow{\text{line2} \text{ += line1} \times (6)} \begin{pmatrix} 1 & 1 & -2 & -3 \\ 0 & 8 & -9 & -18 \\ 8 & 1 & -8 & -8 \end{pmatrix} \xrightarrow{\text{line3} \text{ -= line1} \times (8)} \begin{pmatrix} 1 & 1 & -2 & -3 \\ 0 & 8 & -9 & -18 \\ 0 & -7 & 8 & 16 \end{pmatrix} \\ & \xrightarrow{\text{line2} \text{ += line3}} \begin{pmatrix} 1 & 1 & -2 & -3 \\ 0 & 1 & -1 & -2 \\ 0 & -7 & 8 & 16 \end{pmatrix} \xrightarrow{\text{line1} \text{ -= line2}} \begin{pmatrix} 1 & 0 & -1 & -1 \\ 0 & 1 & -1 & -2 \\ 0 & -7 & 8 & 16 \end{pmatrix} \\ & \xrightarrow{\text{line3} \text{ += line2} \times (7)} \begin{pmatrix} 1 & 0 & -1 & -1 \\ 0 & 1 & -1 & -2 \\ 0 & 0 & 1 & 2 \end{pmatrix} \xrightarrow{\text{line1} \text{ += line3}} \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & -1 & -2 \\ 0 & 0 & 1 & 2 \end{pmatrix} \\ & \xrightarrow{\text{line2} \text{ += line3}} \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 2 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} -1 & 3 & 3 & 7 \\ 0 & -2 & -1 & -6 \\ -2 & -1 & 3 & -7 \end{pmatrix}$$

$$\begin{aligned} & \xrightarrow{\text{line1} \times (-1)} \begin{pmatrix} 1 & -3 & -3 & -7 \\ 0 & -2 & -1 & -6 \\ -2 & -1 & 3 & -7 \end{pmatrix} \xrightarrow{\text{line3} \text{ += line1} \times (2)} \begin{pmatrix} 1 & -3 & -3 & -7 \\ 0 & -2 & -1 & -6 \\ 0 & -7 & -3 & -21 \end{pmatrix} \\ & \xrightarrow{\text{line3} \text{ -= line2} \times (4)} \begin{pmatrix} 1 & -3 & -3 & -7 \\ 0 & -2 & -1 & -6 \\ 0 & 1 & 1 & 3 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -3 & -3 & -7 \\ 0 & 1 & 1 & 3 \\ 0 & -2 & -1 & -6 \end{pmatrix} \\ & \xrightarrow{\text{line1} \text{ += line2} \times (3)} \begin{pmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 1 & 3 \\ 0 & -2 & -1 & -6 \end{pmatrix} \xrightarrow{\text{line3} \text{ += line2} \times (2)} \begin{pmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 1 & 3 \\ 0 & 0 & 1 & 0 \end{pmatrix} \\ & \xrightarrow{\text{line2} \text{ -= line3}} \begin{pmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 3 \\ 0 & 0 & 1 & 0 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 1 & -2 & -1 & 1 \\ 0 & 6 & 7 & 2 \\ 1 & -3 & -2 & 1 \end{pmatrix}$$

$$\begin{array}{ll} \xrightarrow{\text{line3} -= \text{line1}} \begin{pmatrix} 1 & -2 & -1 & 1 \\ 0 & 6 & 7 & 2 \\ 0 & -1 & -1 & 0 \end{pmatrix} & \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -2 & -1 & 1 \\ 0 & -1 & -1 & 0 \\ 0 & 6 & 7 & 2 \end{pmatrix} \\ \xrightarrow{\text{line2} \times = (-1)} \begin{pmatrix} 1 & -2 & -1 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 6 & 7 & 2 \end{pmatrix} & \xrightarrow{\text{line1} += \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 6 & 7 & 2 \end{pmatrix} \\ \xrightarrow{\text{line3} -= \text{line2} \times (6)} \begin{pmatrix} 1 & 0 & 1 & 1 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 2 \end{pmatrix} & \xrightarrow{\text{line1} -= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 1 & 0 \\ 0 & 0 & 1 & 2 \end{pmatrix} \\ \xrightarrow{\text{line2} -= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & -1 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 2 \end{pmatrix} & \end{array}$$

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

$$\begin{array}{ll} \xrightarrow{\text{line2} += \text{line1}} \begin{pmatrix} 1 & -1 & -1 & -1 \\ 0 & -2 & -1 & 6 \\ -2 & 3 & 2 & -1 \end{pmatrix} & \xrightarrow{\text{line3} += \text{line1} \times (2)} \begin{pmatrix} 1 & -1 & -1 & -1 \\ 0 & -2 & -1 & 6 \\ 0 & 1 & 0 & -3 \end{pmatrix} \\ \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -1 & -1 & -1 \\ 0 & 1 & 0 & -3 \\ 0 & -2 & -1 & 6 \end{pmatrix} & \xrightarrow{\text{line1} += \text{line2}} \begin{pmatrix} 1 & 0 & -1 & -4 \\ 0 & 1 & 0 & -3 \\ 0 & -2 & -1 & 6 \end{pmatrix} \\ \xrightarrow{\text{line3} += \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & -1 & -4 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & -1 & 0 \end{pmatrix} & \xrightarrow{\text{line3} \times = (-1)} \begin{pmatrix} 1 & 0 & -1 & -4 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 0 \end{pmatrix} \\ \xrightarrow{\text{line1} += \text{line3}} \begin{pmatrix} 1 & 0 & 0 & -4 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 0 \end{pmatrix} & \end{array}$$

$$\begin{pmatrix} -5 & 3 & -2 & 6 \\ -5 & 4 & -2 & 4 \\ -3 & -1 & -1 & 9 \end{pmatrix}$$

$$\begin{array}{ll} \xrightarrow{\text{line1} -= \text{line2}} \begin{pmatrix} 0 & -1 & 0 & 2 \\ -5 & 4 & -2 & 4 \\ -3 & -1 & -1 & 9 \end{pmatrix} & \xrightarrow{\text{line2} -= \text{line3} \times (2)} \begin{pmatrix} 0 & -1 & 0 & 2 \\ 1 & 6 & 0 & -14 \\ -3 & -1 & -1 & 9 \end{pmatrix} \\ \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & 6 & 0 & -14 \\ 0 & -1 & 0 & 2 \\ -3 & -1 & -1 & 9 \end{pmatrix} & \xrightarrow{\text{line3} += \text{line1} \times (3)} \begin{pmatrix} 1 & 6 & 0 & -14 \\ 0 & -1 & 0 & 2 \\ 0 & 17 & -1 & -33 \end{pmatrix} \\ \xrightarrow{\text{line2} \times = (-1)} \begin{pmatrix} 1 & 6 & 0 & -14 \\ 0 & 1 & 0 & -2 \\ 0 & 17 & -1 & -33 \end{pmatrix} & \xrightarrow{\text{line1} -= \text{line2} \times (6)} \begin{pmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & -2 \\ 0 & 17 & -1 & -33 \end{pmatrix} \\ \xrightarrow{\text{line3} -= \text{line2} \times (17)} \begin{pmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & -1 & 1 \end{pmatrix} & \xrightarrow{\text{line3} \times = (-1)} \begin{pmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & -1 \end{pmatrix} \end{array}$$

$$\begin{pmatrix} 2 & -1 & -1 & 7 \\ -4 & 1 & 6 & -6 \\ -5 & 1 & 8 & -6 \end{pmatrix}$$

$$\begin{aligned} & \xrightarrow{\text{line2} -= \text{line3}} \begin{pmatrix} 2 & -1 & -1 & 7 \\ 1 & 0 & -2 & 0 \\ -5 & 1 & 8 & -6 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & 0 & -2 & 0 \\ 2 & -1 & -1 & 7 \\ -5 & 1 & 8 & -6 \end{pmatrix} \\ & \xrightarrow{\text{line2} -= \text{line1} \times (2)} \begin{pmatrix} 1 & 0 & -2 & 0 \\ 0 & -1 & 3 & 7 \\ -5 & 1 & 8 & -6 \end{pmatrix} \xrightarrow{\text{line3} += \text{line1} \times (5)} \begin{pmatrix} 1 & 0 & -2 & 0 \\ 0 & -1 & 3 & 7 \\ 0 & 1 & -2 & -6 \end{pmatrix} \\ & \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 0 & -2 & 0 \\ 0 & 1 & -2 & -6 \\ 0 & -1 & 3 & 7 \end{pmatrix} \xrightarrow{\text{line3} += \text{line2}} \begin{pmatrix} 1 & 0 & -2 & 0 \\ 0 & 1 & -2 & -6 \\ 0 & 0 & 1 & 1 \end{pmatrix} \\ & \xrightarrow{\text{line1} += \text{line3} \times (2)} \begin{pmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & -2 & -6 \\ 0 & 0 & 1 & 1 \end{pmatrix} \xrightarrow{\text{line2} += \text{line3} \times (2)} \begin{pmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & -4 \\ 0 & 0 & 1 & 1 \end{pmatrix} \end{aligned}$$

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

$$\begin{aligned} & \xrightarrow{\text{line2} += \text{line1}} \begin{pmatrix} 1 & 2 & -6 & -8 \\ 0 & 4 & -11 & -12 \\ -6 & 3 & -5 & 3 \end{pmatrix} \xrightarrow{\text{line3} += \text{line1} \times (6)} \begin{pmatrix} 1 & 2 & -6 & -8 \\ 0 & 4 & -11 & -12 \\ 0 & 15 & -41 & -45 \end{pmatrix} \\ & \xrightarrow{\text{line3} -= \text{line2} \times (4)} \begin{pmatrix} 1 & 2 & -6 & -8 \\ 0 & 4 & -11 & -12 \\ 0 & -1 & 3 & 3 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 2 & -6 & -8 \\ 0 & -1 & 3 & 3 \\ 0 & 4 & -11 & -12 \end{pmatrix} \\ & \xrightarrow{\text{line2} \times = (-1)} \begin{pmatrix} 1 & 2 & -6 & -8 \\ 0 & 1 & -3 & -3 \\ 0 & 4 & -11 & -12 \end{pmatrix} \xrightarrow{\text{line1} -= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & -3 & -3 \\ 0 & 4 & -11 & -12 \end{pmatrix} \\ & \xrightarrow{\text{line3} -= \text{line2} \times (4)} \begin{pmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & -3 & -3 \\ 0 & 0 & 1 & 0 \end{pmatrix} \xrightarrow{\text{line2} += \text{line3} \times (3)} \begin{pmatrix} 1 & 0 & 0 & -2 \\ 0 & 1 & 0 & -3 \\ 0 & 0 & 1 & 0 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 2 & 2 & 1 & 0 \\ 4 & 7 & 7 & 7 \\ -7 & -6 & -2 & 2 \end{pmatrix}$$

$$\begin{aligned} & \xrightarrow{\text{line3} += \text{line1} \times (4)} \begin{pmatrix} 2 & 2 & 1 & 0 \\ 4 & 7 & 7 & 7 \\ 1 & 2 & 2 & 2 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 2 & 2 & 2 \\ 4 & 7 & 7 & 7 \\ 2 & 2 & 1 & 0 \end{pmatrix} \\ & \xrightarrow{\text{line2} -= \text{line1} \times (4)} \begin{pmatrix} 1 & 2 & 2 & 2 \\ 0 & -1 & -1 & -1 \\ 2 & 2 & 1 & 0 \end{pmatrix} \xrightarrow{\text{line3} -= \text{line1} \times (2)} \begin{pmatrix} 1 & 2 & 2 & 2 \\ 0 & -1 & -1 & -1 \\ 0 & -2 & -3 & -4 \end{pmatrix} \\ & \xrightarrow{\text{line2} \times = (-1)} \begin{pmatrix} 1 & 2 & 2 & 2 \\ 0 & 1 & 1 & 1 \\ 0 & -2 & -3 & -4 \end{pmatrix} \xrightarrow{\text{line1} -= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & -2 & -3 & -4 \end{pmatrix} \\ & \xrightarrow{\text{line3} += \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & -1 & -2 \end{pmatrix} \xrightarrow{\text{line3} \times = (-1)} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 1 & 2 \end{pmatrix} \end{aligned}$$

$$\xrightarrow{\text{line2} -= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 2 \end{pmatrix}$$

$$\begin{pmatrix} 2 & -2 & 1 & 1 \\ 3 & -3 & 1 & 3 \\ 3 & -4 & 3 & -2 \end{pmatrix}$$

$$\begin{aligned} &\xrightarrow{\text{line2} -= \text{line1}} \begin{pmatrix} 2 & -2 & 1 & 1 \\ 1 & -1 & 0 & 2 \\ 3 & -4 & 3 & -2 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & -1 & 0 & 2 \\ 2 & -2 & 1 & 1 \\ 3 & -4 & 3 & -2 \end{pmatrix} \\ &\xrightarrow{\text{line2} -= \text{line1} \times (2)} \begin{pmatrix} 1 & -1 & 0 & 2 \\ 0 & 0 & 1 & -3 \\ 3 & -4 & 3 & -2 \end{pmatrix} \xrightarrow{\text{line3} -= \text{line1} \times (3)} \begin{pmatrix} 1 & -1 & 0 & 2 \\ 0 & 0 & 1 & -3 \\ 0 & -1 & 3 & -8 \end{pmatrix} \\ &\xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -1 & 0 & 2 \\ 0 & -1 & 3 & -8 \\ 0 & 0 & 1 & -3 \end{pmatrix} \xrightarrow{\text{line2} \times = (-1)} \begin{pmatrix} 1 & -1 & 0 & 2 \\ 0 & 1 & -3 & 8 \\ 0 & 0 & 1 & -3 \end{pmatrix} \\ &\xrightarrow{\text{line1} += \text{line2}} \begin{pmatrix} 1 & 0 & -3 & 10 \\ 0 & 1 & -3 & 8 \\ 0 & 0 & 1 & -3 \end{pmatrix} \xrightarrow{\text{line1} += \text{line3} \times (3)} \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & -3 & 8 \\ 0 & 0 & 1 & -3 \end{pmatrix} \\ &\xrightarrow{\text{line2} += \text{line3} \times (3)} \begin{pmatrix} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & -3 \end{pmatrix} \end{aligned}$$

$$\begin{pmatrix} 1 & 1 & -1 & 3 \\ -3 & -2 & 3 & -9 \\ -3 & -1 & 2 & -8 \end{pmatrix}$$

$$\begin{aligned} &\xrightarrow{\text{line2} += \text{line1} \times (3)} \begin{pmatrix} 1 & 1 & -1 & 3 \\ 0 & 1 & 0 & 0 \\ -3 & -1 & 2 & -8 \end{pmatrix} \xrightarrow{\text{line3} += \text{line1} \times (3)} \begin{pmatrix} 1 & 1 & -1 & 3 \\ 0 & 1 & 0 & 0 \\ 0 & 2 & -1 & 1 \end{pmatrix} \\ &\xrightarrow{\text{line1} -= \text{line2}} \begin{pmatrix} 1 & 0 & -1 & 3 \\ 0 & 1 & 0 & 0 \\ 0 & 2 & -1 & 1 \end{pmatrix} \xrightarrow{\text{line3} -= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & -1 & 3 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & -1 & 1 \end{pmatrix} \\ &\xrightarrow{\text{line3} \times = (-1)} \begin{pmatrix} 1 & 0 & -1 & 3 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -1 \end{pmatrix} \xrightarrow{\text{line1} += \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 2 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & -1 \end{pmatrix} \end{aligned}$$