(1)

$$\begin{pmatrix}0&0&1&0&2\\1&5&5&1&5\\1&5&5&1&5\\0&0&4&0&8\end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line2}} \begin{pmatrix}1&5&5&1&5\\0&0&1&0&2\\1&5&5&1&5\\0&0&4&0&8\end{pmatrix} \xrightarrow{\text{line3 } -= \text{ line1}} \begin{pmatrix}1&5&5&1&5\\0&0&1&0&2\\0&0&0&0&0\\0&0&4&0&8\end{pmatrix}$$

$$\xrightarrow{\text{line1 } -= \text{ line2}\times(5)} \begin{pmatrix}1&5&0&1&-5\\0&0&1&0&2\\0&0&0&0&0\\0&0&4&0&8\end{pmatrix} \xrightarrow{\text{line4 } -= \text{ line2}\times(4)} \begin{pmatrix}1&5&0&1&-5\\0&0&1&0&2\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(2)

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

$$\xrightarrow{\text{line4 } += \text{ line1}\times(8)} \begin{pmatrix}1&0&-1&-1&-2\\0&1&-2&-2&-1\\0&2&-4&-4&-2\\0&8&-16&-16&-8\end{pmatrix}$$

$$\xrightarrow{\text{line3 } -= \text{ line2}\times(2)} \begin{pmatrix}1&0&-1&-1&-2\\0&1&-2&-2&-1\\0&0&0&0&0\\0&8&-16&-16&-8\end{pmatrix} \xrightarrow{\text{line4 } -= \text{ line2}\times(8)} \begin{pmatrix}1&0&-1&-1&-2\\0&1&-2&-2&-1\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(3)

$$\begin{pmatrix}-2&0&-2&-8&6\\-2&1&-6&-5&8\\-2&1&-6&-5&8\\-1&0&-1&-4&3\end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line4}} \begin{pmatrix}-1&0&-1&-4&3\\-2&1&-6&-5&8\\-2&1&-6&-5&8\\-2&0&-2&-8&6\end{pmatrix} \xrightarrow{\text{line1 } \times= (-1)} \begin{pmatrix}1&0&1&4&-3\\-2&1&-6&-5&8\\-2&1&-6&-5&8\\-2&0&-2&-8&6\end{pmatrix}$$

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

$$\xrightarrow{\text{line4 } += \text{ line1}\times(2)} \begin{pmatrix}1&0&1&4&-3\\0&1&-4&3&2\\0&1&-4&3&2\\0&0&0&0&0\end{pmatrix} \xrightarrow{\text{line3 } -= \text{ line2}} \begin{pmatrix}1&0&1&4&-3\\0&1&-4&3&2\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(4)

$$\begin{pmatrix}0&-2&2&8&-6\\1&0&2&-1&0\\4&-1&9&0&-3\\0&2&-2&-8&6\end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line2}} \begin{pmatrix}1&0&2&-1&0\\0&-2&2&8&-6\\4&-1&9&0&-3\\0&2&-2&-8&6\end{pmatrix} \xrightarrow{\text{line3 } -= \text{ line1}\times(4)} \begin{pmatrix}1&0&2&-1&0\\0&-2&2&8&-6\\0&-1&1&4&-3\\0&2&-2&-8&6\end{pmatrix}$$

$$\xrightarrow{\text{line2 } \leftrightarrow \text{ line4}} \begin{pmatrix}1&0&2&-1&0\\0&2&-2&-8&6\\0&-1&1&4&-3\\0&-2&2&8&-6\end{pmatrix} \xrightarrow{\text{line2 } \times= \left(\frac{1}{2}\right)} \begin{pmatrix}1&0&2&-1&0\\0&1&-1&-4&3\\0&-1&1&4&-3\\0&-2&2&8&-6\end{pmatrix}$$

$$\xrightarrow{\text{line3 } += \text{ line2}} \begin{pmatrix}1&0&2&-1&0\\0&1&-1&-4&3\\0&0&0&0&0\\0&-2&2&8&-6\end{pmatrix} \xrightarrow{\text{line4 } += \text{ line2}\times(2)} \begin{pmatrix}1&0&2&-1&0\\0&1&-1&-4&3\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(5)

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

$$\xrightarrow{\text{line2 } \times= \left(-\frac{1}{5}\right)} \begin{pmatrix}1&-3&-1&-1&3\\0&0&1&0&-1\\0&0&-3&0&3\\0&0&-5&0&5\end{pmatrix} \xrightarrow{\text{line1 } += \text{ line2}} \begin{pmatrix}1&-3&0&-1&2\\0&0&1&0&-1\\0&0&-3&0&3\\0&0&-5&0&5\end{pmatrix}$$

$$\xrightarrow{\text{line3 } += \text{ line2}\times(3)} \begin{pmatrix}1&-3&0&-1&2\\0&0&1&0&-1\\0&0&0&0&0\\0&0&-5&0&5\end{pmatrix} \xrightarrow{\text{line4 } += \text{ line2}\times(5)} \begin{pmatrix}1&-3&0&-1&2\\0&0&1&0&-1\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(6)
$$\begin{pmatrix}0&2&-2&2&4\\1&-3&1&-3&-9\\0&2&-2&2&4\\2&0&-4&0&-6\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line2}}\begin{pmatrix}1&-3&1&-3&-9\\0&2&-2&2&4\\0&2&-2&2&4\\2&0&-4&0&-6\end{pmatrix}\xrightarrow{\text{line4 }-=\text{ line1}\times(2)}\begin{pmatrix}1&-3&1&-3&-9\\0&2&-2&2&4\\0&2&-2&2&4\\0&6&-6&6&12\end{pmatrix}$$
$$\xrightarrow{\text{line2 }\times=\left(\frac{1}{2}\right)}\begin{pmatrix}1&-3&1&-3&-9\\0&1&-1&1&2\\0&2&-2&2&4\\0&6&-6&6&12\end{pmatrix}\xrightarrow{\text{line1 }+=\text{ line2}\times(3)}\begin{pmatrix}1&0&-2&0&-3\\0&1&-1&1&2\\0&2&-2&2&4\\0&6&-6&6&12\end{pmatrix}$$
$$\xrightarrow{\text{line3 }-=\text{ line2}\times(2)}\begin{pmatrix}1&0&-2&0&-3\\0&1&-1&1&2\\0&0&0&0&0\\0&6&-6&6&12\end{pmatrix}\xrightarrow{\text{line4 }-=\text{ line2}\times(6)}\begin{pmatrix}1&0&-2&0&-3\\0&1&-1&1&2\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(7)
$$\begin{pmatrix}0&4&-2&-8&-8\\-1&-1&-2&3&-3\\0&2&-1&-4&-4\\-1&-1&-2&3&-3\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line2}}\begin{pmatrix}-1&-1&-2&3&-3\\0&4&-2&-8&-8\\0&2&-1&-4&-4\\-1&-1&-2&3&-3\end{pmatrix}\xrightarrow{\text{line1 }\times=(-1)}\begin{pmatrix}1&1&2&-3&3\\0&4&-2&-8&-8\\0&2&-1&-4&-4\\-1&-1&-2&3&-3\end{pmatrix}$$
$$\xrightarrow{\text{line4 }+=\text{ line1}}\begin{pmatrix}1&1&2&-3&3\\0&4&-2&-8&-8\\0&2&-1&-4&-4\\0&0&0&0&0\end{pmatrix}\xrightarrow{\text{line2 }\times=\left(\frac{1}{4}\right)}\begin{pmatrix}1&1&2&-3&3\\0&1&-\frac{1}{2}&-2&-2\\0&2&-1&-4&-4\\0&0&0&0&0\end{pmatrix}$$
$$\xrightarrow{\text{line1 }-=\text{ line2}}\begin{pmatrix}1&0&\frac{5}{2}&-1&5\\0&1&-\frac{1}{2}&-2&-2\\0&2&-1&-4&-4\\0&0&0&0&0\end{pmatrix}\xrightarrow{\text{line3 }-=\text{ line2}\times(2)}\begin{pmatrix}1&0&\frac{5}{2}&-1&5\\0&1&-\frac{1}{2}&-2&-2\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(8)
$$\begin{pmatrix}1&-1&-2&-6&0\\1&-1&6&2&8\\0&0&9&9&9\\-1&1&4&8&2\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line1}}\begin{pmatrix}1&-1&-2&-6&0\\0&0&8&8&8\\0&0&9&9&9\\-1&1&4&8&2\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line1}}\begin{pmatrix}1&-1&-2&-6&0\\0&0&8&8&8\\0&0&9&9&9\\0&0&2&2&2\end{pmatrix}$$
$$\xrightarrow{\text{line2 }\times=\left(\frac{1}{8}\right)}\begin{pmatrix}1&-1&-2&-6&0\\0&0&1&1&1\\0&0&9&9&9\\0&0&2&2&2\end{pmatrix}\xrightarrow{\text{line1 }+=\text{ line2}\times(2)}\begin{pmatrix}1&-1&0&-4&2\\0&0&1&1&1\\0&0&9&9&9\\0&0&2&2&2\end{pmatrix}$$
$$\xrightarrow{\text{line3 }-=\text{ line2}\times(9)}\begin{pmatrix}1&-1&0&-4&2\\0&0&1&1&1\\0&0&0&0&0\\0&0&2&2&2\end{pmatrix}\xrightarrow{\text{line4 }-=\text{ line2}\times(2)}\begin{pmatrix}1&-1&0&-4&2\\0&0&1&1&1\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(9)
$$\begin{pmatrix}1&-1&1&-5&-1\\2&-2&4&-8&-6\\0&0&-2&-2&4\\-1&1&-5&1&9\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line1}\times(2)}\begin{pmatrix}1&-1&1&-5&-1\\0&0&2&2&-4\\0&0&-2&-2&4\\-1&1&-5&1&9\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line1}}\begin{pmatrix}1&-1&1&-5&-1\\0&0&2&2&-4\\0&0&-2&-2&4\\0&0&-4&-4&8\end{pmatrix}$$
$$\xrightarrow{\text{line2 }\times=\left(\frac{1}{2}\right)}\begin{pmatrix}1&-1&1&-5&-1\\0&0&1&1&-2\\0&0&-2&-2&4\\0&0&-4&-4&8\end{pmatrix}\xrightarrow{\text{line1 }-=\text{ line2}}\begin{pmatrix}1&-1&0&-6&1\\0&0&1&1&-2\\0&0&-2&-2&4\\0&0&-4&-4&8\end{pmatrix}$$
$$\xrightarrow{\text{line3 }+=\text{ line2}\times(2)}\begin{pmatrix}1&-1&0&-6&1\\0&0&1&1&-2\\0&0&0&0&0\\0&0&-4&-4&8\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line2}\times(4)}\begin{pmatrix}1&-1&0&-6&1\\0&0&1&1&-2\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(10)

$$\begin{pmatrix}-3&-3&3&9&9\\3&-2&-8&6&-4\\4&1&-7&-3&-9\\1&0&-2&0&-2\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&0&-2&0&-2\\3&-2&-8&6&-4\\4&1&-7&-3&-9\\-3&-3&3&9&9\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line1}\times(3)}\begin{pmatrix}1&0&-2&0&-2\\0&-2&-2&6&2\\4&1&-7&-3&-9\\-3&-3&3&9&9\end{pmatrix}$$

$$\xrightarrow{\text{line3 }-=\text{ line1}\times(4)}\begin{pmatrix}1&0&-2&0&-2\\0&-2&-2&6&2\\0&1&1&-3&-1\\-3&-3&3&9&9\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line1}\times(3)}\begin{pmatrix}1&0&-2&0&-2\\0&-2&-2&6&2\\0&1&1&-3&-1\\0&-3&-3&9&3\end{pmatrix}$$

$$\xrightarrow{\text{line2 }\leftrightarrow\text{ line3}}\begin{pmatrix}1&0&-2&0&-2\\0&1&1&-3&-1\\0&-2&-2&6&2\\0&-3&-3&9&3\end{pmatrix}\xrightarrow{\text{line3 }+=\text{ line2}\times(2)}\begin{pmatrix}1&0&-2&0&-2\\0&1&1&-3&-1\\0&0&0&0&0\\0&-3&-3&9&3\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line2}\times(3)}\begin{pmatrix}1&0&-2&0&-2\\0&1&1&-3&-1\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(11)

$$\begin{pmatrix}-3&2&7&0&1\\1&2&3&8&5\\0&-3&-6&-9&-6\\3&0&-3&6&3\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line2}}\begin{pmatrix}1&2&3&8&5\\-3&2&7&0&1\\0&-3&-6&-9&-6\\3&0&-3&6&3\end{pmatrix}\xrightarrow{\text{line2 }+=\text{ line1}\times(3)}\begin{pmatrix}1&2&3&8&5\\0&8&16&24&16\\0&-3&-6&-9&-6\\3&0&-3&6&3\end{pmatrix}$$

$$\xrightarrow{\text{line4 }-=\text{ line1}\times(3)}\begin{pmatrix}1&2&3&8&5\\0&8&16&24&16\\0&-3&-6&-9&-6\\0&-6&-12&-18&-12\end{pmatrix}\xrightarrow{\text{line2 }\times=\left(\frac{1}{8}\right)}\begin{pmatrix}1&2&3&8&5\\0&1&2&3&2\\0&-3&-6&-9&-6\\0&-6&-12&-18&-12\end{pmatrix}$$

$$\xrightarrow{\text{line1 }-=\text{ line2}\times(2)}\begin{pmatrix}1&0&-1&2&1\\0&1&2&3&2\\0&-3&-6&-9&-6\\0&-6&-12&-18&-12\end{pmatrix}\xrightarrow{\text{line3 }+=\text{ line2}\times(3)}\begin{pmatrix}1&0&-1&2&1\\0&1&2&3&2\\0&0&0&0&0\\0&-6&-12&-18&-12\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line2}\times(6)}\begin{pmatrix}1&0&-1&2&1\\0&1&2&3&2\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(12)

$$\begin{pmatrix}-3&3&-3&3&9\\0&0&2&2&-8\\2&-2&-1&-5&6\\5&-5&3&-7&-7\end{pmatrix}\xrightarrow{\text{line1 }\times=\left(-\frac{1}{3}\right)}\begin{pmatrix}1&-1&1&-1&-3\\0&0&2&2&-8\\2&-2&-1&-5&6\\5&-5&3&-7&-7\end{pmatrix}\xrightarrow{\text{line3 }-=\text{ line1}\times(2)}\begin{pmatrix}1&-1&1&-1&-3\\0&0&2&2&-8\\0&0&-3&-3&12\\5&-5&3&-7&-7\end{pmatrix}$$

$$\xrightarrow{\text{line4 }-=\text{ line1}\times(5)}\begin{pmatrix}1&-1&1&-1&-3\\0&0&2&2&-8\\0&0&-3&-3&12\\0&0&-2&-2&8\end{pmatrix}\xrightarrow{\text{line2 }\times=\left(\frac{1}{2}\right)}\begin{pmatrix}1&-1&1&-1&-3\\0&0&1&1&-4\\0&0&-3&-3&12\\0&0&-2&-2&8\end{pmatrix}$$

$$\xrightarrow{\text{line1 }-=\text{ line2}}\begin{pmatrix}1&-1&0&-2&1\\0&0&1&1&-4\\0&0&-3&-3&12\\0&0&-2&-2&8\end{pmatrix}\xrightarrow{\text{line3 }+=\text{ line2}\times(3)}\begin{pmatrix}1&-1&0&-2&1\\0&0&1&1&-4\\0&0&0&0&0\\0&0&-2&-2&8\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line2}\times(2)}\begin{pmatrix}1&-1&0&-2&1\\0&0&1&1&-4\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(13)

$$\begin{pmatrix} -3 & 3 & 3 & 9 & 3 \\ 2 & 0 & 6 & -4 & 2 \\ 2 & 0 & 6 & -4 & 2 \\ -2 & 1 & -2 & 5 & 0 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 2 & 0 & 6 & -4 & 2 \\ -3 & 3 & 3 & 9 & 3 \\ 2 & 0 & 6 & -4 & 2 \\ -2 & 1 & -2 & 5 & 0 \end{pmatrix} \xrightarrow{\text{line1} \times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & 3 & -2 & 1 \\ -3 & 3 & 3 & 9 & 3 \\ 2 & 0 & 6 & -4 & 2 \\ -2 & 1 & -2 & 5 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line1} \times (3)} \begin{pmatrix} 1 & 0 & 3 & -2 & 1 \\ 0 & 3 & 12 & 3 & 6 \\ 2 & 0 & 6 & -4 & 2 \\ -2 & 1 & -2 & 5 & 0 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line1} \times (2)} \begin{pmatrix} 1 & 0 & 3 & -2 & 1 \\ 0 & 3 & 12 & 3 & 6 \\ 0 & 0 & 0 & 0 & 0 \\ -2 & 1 & -2 & 5 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line1} \times (2)} \begin{pmatrix} 1 & 0 & 3 & -2 & 1 \\ 0 & 3 & 12 & 3 & 6 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 1 & 4 & 1 & 2 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 0 & 3 & -2 & 1 \\ 0 & 1 & 4 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 3 & 12 & 3 & 6 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line2} \times (3)} \begin{pmatrix} 1 & 0 & 3 & -2 & 1 \\ 0 & 1 & 4 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

(14)

$$\begin{pmatrix} -1 & -5 & -3 & -5 & -5 \\ 1 & 5 & 3 & 1 & 1 \\ 0 & 0 & 0 & 3 & 3 \\ 1 & 5 & 3 & 1 & 1 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & 5 & 3 & 1 & 1 \\ -1 & -5 & -3 & -5 & -5 \\ 0 & 0 & 0 & 3 & 3 \\ 1 & 5 & 3 & 1 & 1 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & 5 & 3 & 1 & 1 \\ 0 & 0 & 0 & -4 & -4 \\ 0 & 0 & 0 & 3 & 3 \\ 1 & 5 & 3 & 1 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line1}} \begin{pmatrix} 1 & 5 & 3 & 1 & 1 \\ 0 & 0 & 0 & -4 & -4 \\ 0 & 0 & 0 & 3 & 3 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 5 & 3 & 1 & 1 \\ 0 & 0 & 0 & 3 & 3 \\ 0 & 0 & 0 & -4 & -4 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \times= \left(\frac{1}{3}\right)} \begin{pmatrix} 1 & 5 & 3 & 1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & -4 & -4 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line2}} \begin{pmatrix} 1 & 5 & 3 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & -4 & -4 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{+}= \text{line2} \times (4)} \begin{pmatrix} 1 & 5 & 3 & 0 & 0 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

(15)

$$\begin{pmatrix} 0 & -2 & -4 & -2 & -4 \\ -2 & -1 & 8 & -1 & -4 \\ 1 & -2 & -9 & -2 & -3 \\ -1 & -4 & -3 & -4 & -9 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -2 & -9 & -2 & -3 \\ -2 & -1 & 8 & -1 & -4 \\ 0 & -2 & -4 & -2 & -4 \\ -1 & -4 & -3 & -4 & -9 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line1} \times (2)} \begin{pmatrix} 1 & -2 & -9 & -2 & -3 \\ 0 & -5 & -10 & -5 & -10 \\ 0 & -2 & -4 & -2 & -4 \\ -1 & -4 & -3 & -4 & -9 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & -2 & -9 & -2 & -3 \\ 0 & -5 & -10 & -5 & -10 \\ 0 & -2 & -4 & -2 & -4 \\ 0 & -6 & -12 & -6 & -12 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(-\frac{1}{5}\right)} \begin{pmatrix} 1 & -2 & -9 & -2 & -3 \\ 0 & 1 & 2 & 1 & 2 \\ 0 & -2 & -4 & -2 & -4 \\ 0 & -6 & -12 & -6 & -12 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{+}= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & -5 & 0 & 1 \\ 0 & 1 & 2 & 1 & 2 \\ 0 & -2 & -4 & -2 & -4 \\ 0 & -6 & -12 & -6 & -12 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & -5 & 0 & 1 \\ 0 & 1 & 2 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -6 & -12 & -6 & -12 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line2} \times (6)} \begin{pmatrix} 1 & 0 & -5 & 0 & 1 \\ 0 & 1 & 2 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

(16)

$$\begin{pmatrix} 0 & 0 & -1 & 3 & 0 \\ 0 & 0 & 2 & -6 & 0 \\ -1 & 3 & 2 & -8 & 1 \\ 1 & -3 & 2 & -4 & -1 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & -3 & 2 & -4 & -1 \\ 0 & 0 & 2 & -6 & 0 \\ -1 & 3 & 2 & -8 & 1 \\ 0 & 0 & -1 & 3 & 0 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & -3 & 2 & -4 & -1 \\ 0 & 0 & 2 & -6 & 0 \\ 0 & 0 & 4 & -12 & 0 \\ 0 & 0 & -1 & 3 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & -3 & 2 & -4 & -1 \\ 0 & 0 & -1 & 3 & 0 \\ 0 & 0 & 4 & -12 & 0 \\ 0 & 0 & 2 & -6 & 0 \end{pmatrix} \xrightarrow{\text{line2} \times= (-1)} \begin{pmatrix} 1 & -3 & 2 & -4 & -1 \\ 0 & 0 & 1 & -3 & 0 \\ 0 & 0 & 4 & -12 & 0 \\ 0 & 0 & 2 & -6 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line2}\times(2)} \begin{pmatrix} 1 & -3 & 0 & 2 & -1 \\ 0 & 0 & 1 & -3 & 0 \\ 0 & 0 & 4 & -12 & 0 \\ 0 & 0 & 2 & -6 & 0 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line2}\times(4)} \begin{pmatrix} 1 & -3 & 0 & 2 & -1 \\ 0 & 0 & 1 & -3 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 2 & -6 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line2}\times(2)} \begin{pmatrix} 1 & -3 & 0 & 2 & -1 \\ 0 & 0 & 1 & -3 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

(17)

$$\begin{pmatrix} 0 & 0 & 0 & 4 & -1 \\ 1 & 5 & -1 & 5 & -1 \\ 1 & 5 & -1 & 1 & 0 \\ 0 & 0 & 0 & -8 & 2 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & 5 & -1 & 5 & -1 \\ 0 & 0 & 0 & 4 & -1 \\ 1 & 5 & -1 & 1 & 0 \\ 0 & 0 & 0 & -8 & 2 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line1}} \begin{pmatrix} 1 & 5 & -1 & 5 & -1 \\ 0 & 0 & 0 & 4 & -1 \\ 0 & 0 & 0 & -4 & 1 \\ 0 & 0 & 0 & -8 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line3}} \begin{pmatrix} 1 & 5 & -1 & 5 & -1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -4 & 1 \\ 0 & 0 & 0 & -8 & 2 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 5 & -1 & 5 & -1 \\ 0 & 0 & 0 & -4 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -8 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \times= \left(-\frac{1}{4}\right)} \begin{pmatrix} 1 & 5 & -1 & 5 & -1 \\ 0 & 0 & 0 & 1 & -\frac{1}{4} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -8 & 2 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line2}\times(5)} \begin{pmatrix} 1 & 5 & -1 & 0 & \frac{1}{4} \\ 0 & 0 & 0 & 1 & -\frac{1}{4} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & -8 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line2}\times(8)} \begin{pmatrix} 1 & 5 & -1 & 0 & \frac{1}{4} \\ 0 & 0 & 0 & 1 & -\frac{1}{4} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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

$$\xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 4 & -6 & 1 & -8 \\ 0 & 4 & -4 & 0 & -4 \\ 0 & -2 & 2 & 0 & 2 \\ 0 & 3 & -3 & 0 & -3 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(\frac{1}{4}\right)} \begin{pmatrix} 1 & 4 & -6 & 1 & -8 \\ 0 & 1 & -1 & 0 & -1 \\ 0 & -2 & 2 & 0 & 2 \\ 0 & 3 & -3 & 0 & -3 \end{pmatrix}$$

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

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line2}\times(3)} \begin{pmatrix} 1 & 0 & -2 & 1 & -4 \\ 0 & 1 & -1 & 0 & -1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix}0&6&-6&0&-6\\6&-3&-9&6&-9\\2&-3&-1&2&-1\\1&-2&0&1&0\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&-2&0&1&0\\6&-3&-9&6&-9\\2&-3&-1&2&-1\\0&6&-6&0&-6\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line1}\times(6)}\begin{pmatrix}1&-2&0&1&0\\0&9&-9&0&-9\\2&-3&-1&2&-1\\0&6&-6&0&-6\end{pmatrix}$$

$$\xrightarrow{\text{line3 }-=\text{ line1}\times(2)}\begin{pmatrix}1&-2&0&1&0\\0&9&-9&0&-9\\0&1&-1&0&-1\\0&6&-6&0&-6\end{pmatrix}\xrightarrow{\text{line2 }\leftrightarrow\text{ line3}}\begin{pmatrix}1&-2&0&1&0\\0&1&-1&0&-1\\0&9&-9&0&-9\\0&6&-6&0&-6\end{pmatrix}$$

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

$$\xrightarrow{\text{line4 }-=\text{ line2}\times(6)}\begin{pmatrix}1&0&-2&1&-2\\0&1&-1&0&-1\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}1&-1&-3&-3&-3\\2&1&6&-3&3\\1&-1&-3&-3&-3\\1&-2&-7&-4&-6\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line1}\times(2)}\begin{pmatrix}1&-1&-3&-3&-3\\0&3&12&3&9\\1&-1&-3&-3&-3\\1&-2&-7&-4&-6\end{pmatrix}\xrightarrow{\text{line3 }-=\text{ line1}}\begin{pmatrix}1&-1&-3&-3&-3\\0&3&12&3&9\\0&0&0&0&0\\1&-2&-7&-4&-6\end{pmatrix}$$

$$\xrightarrow{\text{line4 }-=\text{ line1}}\begin{pmatrix}1&-1&-3&-3&-3\\0&3&12&3&9\\0&0&0&0&0\\0&-1&-4&-1&-3\end{pmatrix}\xrightarrow{\text{line2 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&-1&-3&-3&-3\\0&-1&-4&-1&-3\\0&0&0&0&0\\0&3&12&3&9\end{pmatrix}$$

$$\xrightarrow{\text{line2 }\times=(-1)}\begin{pmatrix}1&-1&-3&-3&-3\\0&1&4&1&3\\0&0&0&0&0\\0&3&12&3&9\end{pmatrix}\xrightarrow{\text{line1 }+=\text{ line2}}\begin{pmatrix}1&0&1&-2&0\\0&1&4&1&3\\0&0&0&0&0\\0&3&12&3&9\end{pmatrix}$$

$$\xrightarrow{\text{line4 }-=\text{ line2}\times(3)}\begin{pmatrix}1&0&1&-2&0\\0&1&4&1&3\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}1&1&-5&-3&1\\1&-2&7&0&-8\\-2&1&-2&3&7\\-1&0&1&2&2\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line1}}\begin{pmatrix}1&1&-5&-3&1\\0&-3&12&3&-9\\-2&1&-2&3&7\\-1&0&1&2&2\end{pmatrix}\xrightarrow{\text{line3 }+=\text{ line1}\times(2)}\begin{pmatrix}1&1&-5&-3&1\\0&-3&12&3&-9\\0&3&-12&-3&9\\-1&0&1&2&2\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line1}}\begin{pmatrix}1&1&-5&-3&1\\0&-3&12&3&-9\\0&3&-12&-3&9\\0&1&-4&-1&3\end{pmatrix}\xrightarrow{\text{line2 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&1&-5&-3&1\\0&1&-4&-1&3\\0&3&-12&-3&9\\0&-3&12&3&-9\end{pmatrix}$$

$$\xrightarrow{\text{line1 }-=\text{ line2}}\begin{pmatrix}1&0&-1&-2&-2\\0&1&-4&-1&3\\0&3&-12&-3&9\\0&-3&12&3&-9\end{pmatrix}\xrightarrow{\text{line3 }-=\text{ line2}\times(3)}\begin{pmatrix}1&0&-1&-2&-2\\0&1&-4&-1&3\\0&0&0&0&0\\0&-3&12&3&-9\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line2}\times(3)}\begin{pmatrix}1&0&-1&-2&-2\\0&1&-4&-1&3\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}1&1&1&1&3\\3&3&3&3&9\\-2&6&2&-6&-2\\2&-2&0&4&4\end{pmatrix}\xrightarrow{\text{line2 -= line1×(3)}}\begin{pmatrix}1&1&1&1&3\\0&0&0&0&0\\-2&6&2&-6&-2\\2&-2&0&4&4\end{pmatrix}\xrightarrow{\text{line3 += line1×(2)}}\begin{pmatrix}1&1&1&1&3\\0&0&0&0&0\\0&8&4&-4&4\\2&-2&0&4&4\end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line1×(2)}}\begin{pmatrix}1&1&1&1&3\\0&0&0&0&0\\0&8&4&-4&4\\0&-4&-2&2&-2\end{pmatrix}\xrightarrow{\text{line2 ↔ line3}}\begin{pmatrix}1&1&1&1&3\\0&8&4&-4&4\\0&0&0&0&0\\0&-4&-2&2&-2\end{pmatrix}$$

$$\xrightarrow{\text{line2 ×= }\left(\frac{1}{8}\right)}\begin{pmatrix}1&1&1&1&3\\0&1&\frac{1}{2}&-\frac{1}{2}&\frac{1}{2}\\0&0&0&0&0\\0&-4&-2&2&-2\end{pmatrix}\xrightarrow{\text{line1 -= line2}}\begin{pmatrix}1&0&\frac{1}{2}&\frac{3}{2}&\frac{5}{2}\\0&1&\frac{1}{2}&-\frac{1}{2}&\frac{1}{2}\\0&0&0&0&0\\0&-4&-2&2&-2\end{pmatrix}\xrightarrow{\text{line4 += line2×(4)}}\begin{pmatrix}1&0&\frac{1}{2}&\frac{3}{2}&\frac{5}{2}\\0&1&\frac{1}{2}&-\frac{1}{2}&\frac{1}{2}\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

(23)

$$\begin{pmatrix}2&1&-4&3&-3\\1&-2&3&4&-4\\2&-3&4&7&-7\\1&-2&3&4&-4\end{pmatrix}\xrightarrow{\text{line1 ↔ line2}}\begin{pmatrix}1&-2&3&4&-4\\2&1&-4&3&-3\\2&-3&4&7&-7\\1&-2&3&4&-4\end{pmatrix}\xrightarrow{\text{line2 -= line1×(2)}}\begin{pmatrix}1&-2&3&4&-4\\0&5&-10&-5&5\\2&-3&4&7&-7\\1&-2&3&4&-4\end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line1×(2)}}\begin{pmatrix}1&-2&3&4&-4\\0&5&-10&-5&5\\0&1&-2&-1&1\\1&-2&3&4&-4\end{pmatrix}\xrightarrow{\text{line4 -= line1}}\begin{pmatrix}1&-2&3&4&-4\\0&5&-10&-5&5\\0&1&-2&-1&1\\0&0&0&0&0\end{pmatrix}$$

$$\xrightarrow{\text{line2 ↔ line3}}\begin{pmatrix}1&-2&3&4&-4\\0&1&-2&-1&1\\0&5&-10&-5&5\\0&0&0&0&0\end{pmatrix}\xrightarrow{\text{line1 += line2×(2)}}\begin{pmatrix}1&0&-1&2&-2\\0&1&-2&-1&1\\0&5&-10&-5&5\\0&0&0&0&0\end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line2×(5)}}\begin{pmatrix}1&0&-1&2&-2\\0&1&-2&-1&1\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}3&-1&9&5&-1\\1&2&-4&4&-5\\4&1&5&9&-6\\0&-2&6&-2&4\end{pmatrix}\xrightarrow{\text{line1 ↔ line2}}\begin{pmatrix}1&2&-4&4&-5\\3&-1&9&5&-1\\4&1&5&9&-6\\0&-2&6&-2&4\end{pmatrix}\xrightarrow{\text{line2 -= line1×(3)}}\begin{pmatrix}1&2&-4&4&-5\\0&-7&21&-7&14\\4&1&5&9&-6\\0&-2&6&-2&4\end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line1×(4)}}\begin{pmatrix}1&2&-4&4&-5\\0&-7&21&-7&14\\0&-7&21&-7&14\\0&-2&6&-2&4\end{pmatrix}\xrightarrow{\text{line2 ×= }\left(-\frac{1}{7}\right)}\begin{pmatrix}1&2&-4&4&-5\\0&1&-3&1&-2\\0&-7&21&-7&14\\0&-2&6&-2&4\end{pmatrix}$$

$$\xrightarrow{\text{line1 -= line2×(2)}}\begin{pmatrix}1&0&2&2&-1\\0&1&-3&1&-2\\0&-7&21&-7&14\\0&-2&6&-2&4\end{pmatrix}\xrightarrow{\text{line3 += line2×(7)}}\begin{pmatrix}1&0&2&2&-1\\0&1&-3&1&-2\\0&0&0&0&0\\0&-2&6&-2&4\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2×(2)}}\begin{pmatrix}1&0&2&2&-1\\0&1&-3&1&-2\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix} -3 & -9 & 3 & 3 & -9 \\ -4 & -6 & 4 & -5 & 0 \\ 3 & 9 & -3 & -3 & 9 \\ 3 & 7 & -3 & 0 & 5 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 3 & 9 & -3 & -3 & 9 \\ -4 & -6 & 4 & -5 & 0 \\ -3 & -9 & 3 & 3 & -9 \\ 3 & 7 & -3 & 0 & 5 \end{pmatrix} \xrightarrow{\text{line1} \times= \left(\frac{1}{3}\right)} \begin{pmatrix} 1 & 3 & -1 & -1 & 3 \\ -4 & -6 & 4 & -5 & 0 \\ -3 & -9 & 3 & 3 & -9 \\ 3 & 7 & -3 & 0 & 5 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line1}\times(4)} \begin{pmatrix} 1 & 3 & -1 & -1 & 3 \\ 0 & 6 & 0 & -9 & 12 \\ -3 & -9 & 3 & 3 & -9 \\ 3 & 7 & -3 & 0 & 5 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line1}\times(3)} \begin{pmatrix} 1 & 3 & -1 & -1 & 3 \\ 0 & 6 & 0 & -9 & 12 \\ 0 & 0 & 0 & 0 & 0 \\ 3 & 7 & -3 & 0 & 5 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line1}\times(3)} \begin{pmatrix} 1 & 3 & -1 & -1 & 3 \\ 0 & 6 & 0 & -9 & 12 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -2 & 0 & 3 & -4 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(\frac{1}{6}\right)} \begin{pmatrix} 1 & 3 & -1 & -1 & 3 \\ 0 & 1 & 0 & -\frac{3}{2} & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -2 & 0 & 3 & -4 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line2}\times(3)} \begin{pmatrix} 1 & 0 & -1 & \frac{7}{2} & -3 \\ 0 & 1 & 0 & -\frac{3}{2} & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -2 & 0 & 3 & -4 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2}\times(2)} \begin{pmatrix} 1 & 0 & -1 & \frac{7}{2} & -3 \\ 0 & 1 & 0 & -\frac{3}{2} & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

(26)

$$\begin{pmatrix} -2 & 2 & -2 & -2 & -2 \\ -1 & 1 & -1 & -1 & 7 \\ 8 & -8 & 8 & 8 & 0 \\ 1 & -1 & 1 & 1 & -5 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & -1 & 1 & 1 & -5 \\ -1 & 1 & -1 & -1 & 7 \\ 8 & -8 & 8 & 8 & 0 \\ -2 & 2 & -2 & -2 & -2 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & -1 & 1 & 1 & -5 \\ 0 & 0 & 0 & 0 & 2 \\ 8 & -8 & 8 & 8 & 0 \\ -2 & 2 & -2 & -2 & -2 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line1}\times(8)} \begin{pmatrix} 1 & -1 & 1 & 1 & -5 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 & 40 \\ -2 & 2 & -2 & -2 & -2 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line1}\times(2)} \begin{pmatrix} 1 & -1 & 1 & 1 & -5 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 & 40 \\ 0 & 0 & 0 & 0 & -12 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & -1 & 1 & 1 & -5 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 40 \\ 0 & 0 & 0 & 0 & -12 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line2}\times(5)} \begin{pmatrix} 1 & -1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 40 \\ 0 & 0 & 0 & 0 & -12 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line2}\times(40)} \begin{pmatrix} 1 & -1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & -12 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2}\times(12)} \begin{pmatrix} 1 & -1 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

(27)

$$\begin{pmatrix} -2 & 6 & 8 & -7 & 3 \\ 2 & -6 & -6 & 8 & -4 \\ 1 & -3 & -1 & 5 & -3 \\ -1 & 3 & 9 & -1 & -1 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -3 & -1 & 5 & -3 \\ 2 & -6 & -6 & 8 & -4 \\ -2 & 6 & 8 & -7 & 3 \\ -1 & 3 & 9 & -1 & -1 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line1}\times(2)} \begin{pmatrix} 1 & -3 & -1 & 5 & -3 \\ 0 & 0 & -4 & -2 & 2 \\ -2 & 6 & 8 & -7 & 3 \\ -1 & 3 & 9 & -1 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{+}= \text{line1}\times(2)} \begin{pmatrix} 1 & -3 & -1 & 5 & -3 \\ 0 & 0 & -4 & -2 & 2 \\ 0 & 0 & 6 & 3 & -3 \\ -1 & 3 & 9 & -1 & -1 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & -3 & -1 & 5 & -3 \\ 0 & 0 & -4 & -2 & 2 \\ 0 & 0 & 6 & 3 & -3 \\ 0 & 0 & 8 & 4 & -4 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \times= \left(-\frac{1}{4}\right)} \begin{pmatrix} 1 & -3 & -1 & 5 & -3 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 6 & 3 & -3 \\ 0 & 0 & 8 & 4 & -4 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line2}} \begin{pmatrix} 1 & -3 & 0 & \frac{11}{2} & -\frac{7}{2} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 6 & 3 & -3 \\ 0 & 0 & 8 & 4 & -4 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line2}\times(6)} \begin{pmatrix} 1 & -3 & 0 & \frac{11}{2} & -\frac{7}{2} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 8 & 4 & -4 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{-}= \text{line2}\times(8)} \begin{pmatrix} 1 & -3 & 0 & \frac{11}{2} & -\frac{7}{2} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

(28)

$$\begin{pmatrix}-1&-3&-3&-8&-8\\0&0&0&-2&-2\\2&6&6&3&3\\-2&-6&-6&5&5\end{pmatrix}\xrightarrow{\text{line1 }\times=(-1)}\begin{pmatrix}1&3&3&8&8\\0&0&0&-2&-2\\2&6&6&3&3\\-2&-6&-6&5&5\end{pmatrix}\xrightarrow{\text{line3 }-=\text{ line1}\times(2)}\begin{pmatrix}1&3&3&8&8\\0&0&0&-2&-2\\0&0&0&-13&-13\\-2&-6&-6&5&5\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line1}\times(2)}\begin{pmatrix}1&3&3&8&8\\0&0&0&-2&-2\\0&0&0&-13&-13\\0&0&0&21&21\end{pmatrix}\xrightarrow{\text{line2 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&3&3&8&8\\0&0&0&21&21\\0&0&0&-13&-13\\0&0&0&-2&-2\end{pmatrix}$$

$$\xrightarrow{\text{line2 }\times=\left(\frac{1}{21}\right)}\begin{pmatrix}1&3&3&8&8\\0&0&0&1&1\\0&0&0&-13&-13\\0&0&0&-2&-2\end{pmatrix}\xrightarrow{\text{line1 }-=\text{ line2}\times(8)}\begin{pmatrix}1&3&3&0&0\\0&0&0&1&1\\0&0&0&-13&-13\\0&0&0&-2&-2\end{pmatrix}$$

$$\xrightarrow{\text{line3 }+=\text{ line2}\times(13)}\begin{pmatrix}1&3&3&0&0\\0&0&0&1&1\\0&0&0&0&0\\0&0&0&-2&-2\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line2}\times(2)}\begin{pmatrix}1&3&3&0&0\\0&0&0&1&1\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}-1&-2&7&0&-4\\-1&-3&9&-1&-7\\-3&0&9&6&6\\1&-1&-1&-3&-5\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&-1&-1&-3&-5\\-1&-3&9&-1&-7\\-3&0&9&6&6\\-1&-2&7&0&-4\end{pmatrix}\xrightarrow{\text{line2 }+=\text{ line1}}\begin{pmatrix}1&-1&-1&-3&-5\\0&-4&8&-4&-12\\-3&0&9&6&6\\-1&-2&7&0&-4\end{pmatrix}$$

$$\xrightarrow{\text{line3 }+=\text{ line1}\times(3)}\begin{pmatrix}1&-1&-1&-3&-5\\0&-4&8&-4&-12\\0&-3&6&-3&-9\\-1&-2&7&0&-4\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line1}}\begin{pmatrix}1&-1&-1&-3&-5\\0&-4&8&-4&-12\\0&-3&6&-3&-9\\0&-3&6&-3&-9\end{pmatrix}$$

$$\xrightarrow{\text{line2 }\times=\left(-\frac{1}{4}\right)}\begin{pmatrix}1&-1&-1&-3&-5\\0&1&-2&1&3\\0&-3&6&-3&-9\\0&-3&6&-3&-9\end{pmatrix}\xrightarrow{\text{line1 }+=\text{ line2}}\begin{pmatrix}1&0&-3&-2&-2\\0&1&-2&1&3\\0&-3&6&-3&-9\\0&-3&6&-3&-9\end{pmatrix}$$

$$\xrightarrow{\text{line3 }+=\text{ line2}\times(3)}\begin{pmatrix}1&0&-3&-2&-2\\0&1&-2&1&3\\0&0&0&0&0\\0&-3&6&-3&-9\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line2}\times(3)}\begin{pmatrix}1&0&-3&-2&-2\\0&1&-2&1&3\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}-1&1&-1&9&5\\1&-1&1&-9&-1\\-1&1&-1&9&-1\\1&-1&1&-9&9\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line2}}\begin{pmatrix}1&-1&1&-9&-1\\-1&1&-1&9&5\\-1&1&-1&9&-1\\1&-1&1&-9&9\end{pmatrix}\xrightarrow{\text{line2 }+=\text{ line1}}\begin{pmatrix}1&-1&1&-9&-1\\0&0&0&0&4\\-1&1&-1&9&-1\\1&-1&1&-9&9\end{pmatrix}$$

$$\xrightarrow{\text{line3 }+=\text{ line1}}\begin{pmatrix}1&-1&1&-9&-1\\0&0&0&0&4\\0&0&0&0&-2\\1&-1&1&-9&9\end{pmatrix}\xrightarrow{\text{line4 }-=\text{ line1}}\begin{pmatrix}1&-1&1&-9&-1\\0&0&0&0&4\\0&0&0&0&-2\\0&0&0&0&10\end{pmatrix}$$

$$\xrightarrow{\text{line2 }\times=\left(\frac{1}{4}\right)}\begin{pmatrix}1&-1&1&-9&-1\\0&0&0&0&1\\0&0&0&0&-2\\0&0&0&0&10\end{pmatrix}\xrightarrow{\text{line1 }+=\text{ line2}}\begin{pmatrix}1&-1&1&-9&0\\0&0&0&0&1\\0&0&0&0&-2\\0&0&0&0&10\end{pmatrix}$$

$$\xrightarrow{\text{line3 }+=\text{ line2}\times(2)}\begin{pmatrix}1&-1&1&-9&0\\0&0&0&0&1\\0&0&0&0&0\\0&0&0&0&10\end{pmatrix}\xrightarrow{\text{line4 }-=\text{ line2}\times(10)}\begin{pmatrix}1&-1&1&-9&0\\0&0&0&0&1\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix} -1 & 2 & 5 & 4 & 3 \\ 2 & -2 & -6 & -2 & -4 \\ 0 & -1 & -2 & -3 & 0 \\ 3 & -3 & -9 & -3 & -6 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 2 & -2 & -6 & -2 & -4 \\ -1 & 2 & 5 & 4 & 3 \\ 0 & -1 & -2 & -3 & 0 \\ 3 & -3 & -9 & -3 & -6 \end{pmatrix} \xrightarrow{\text{line1} \times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & -1 & -3 & -1 & -2 \\ -1 & 2 & 5 & 4 & 3 \\ 0 & -1 & -2 & -3 & 0 \\ 3 & -3 & -9 & -3 & -6 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & -1 & -3 & -1 & -2 \\ 0 & 1 & 2 & 3 & 1 \\ 0 & -1 & -2 & -3 & 0 \\ 3 & -3 & -9 & -3 & -6 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{-}= \text{line1} \times (3)} \begin{pmatrix} 1 & -1 & -3 & -1 & -2 \\ 0 & 1 & 2 & 3 & 1 \\ 0 & -1 & -2 & -3 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{+}= \text{line2}} \begin{pmatrix} 1 & 0 & -1 & 2 & -1 \\ 0 & 1 & 2 & 3 & 1 \\ 0 & -1 & -2 & -3 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line2}} \begin{pmatrix} 1 & 0 & -1 & 2 & -1 \\ 0 & 1 & 2 & 3 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{+}= \text{line3}} \begin{pmatrix} 1 & 0 & -1 & 2 & 0 \\ 0 & 1 & 2 & 3 & 1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line3}} \begin{pmatrix} 1 & 0 & -1 & 2 & 0 \\ 0 & 1 & 2 & 3 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 0 & -3 & -3 & -2 & 2 \\ 2 & 5 & 3 & 4 & 4 \\ 2 & 5 & 3 & 4 & 4 \\ 3 & 9 & 6 & 7 & 5 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line3}} \begin{pmatrix} 0 & -3 & -3 & -2 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 2 & 5 & 3 & 4 & 4 \\ 3 & 9 & 6 & 7 & 5 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{-}= \text{line3}} \begin{pmatrix} 0 & -3 & -3 & -2 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 2 & 5 & 3 & 4 & 4 \\ 1 & 4 & 3 & 3 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 4 & 3 & 3 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 2 & 5 & 3 & 4 & 4 \\ 0 & -3 & -3 & -2 & 2 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line1} \times (2)} \begin{pmatrix} 1 & 4 & 3 & 3 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -3 & -3 & -2 & 2 \\ 0 & -3 & -3 & -2 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line4}} \begin{pmatrix} 1 & 4 & 3 & 3 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -3 & -3 & -2 & 2 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 4 & 3 & 3 & 1 \\ 0 & -3 & -3 & -2 & 2 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \times= \left(-\frac{1}{3}\right)} \begin{pmatrix} 1 & 4 & 3 & 3 & 1 \\ 0 & 1 & 1 & \frac{2}{3} & -\frac{2}{3} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line2} \times (4)} \begin{pmatrix} 1 & 0 & -1 & \frac{1}{3} & \frac{11}{3} \\ 0 & 1 & 1 & \frac{2}{3} & -\frac{2}{3} \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 0 & 0 & 1 & 1 & -3 \\ 2 & -2 & 1 & -3 & -3 \\ -1 & 1 & 2 & 4 & -6 \\ -6 & 6 & -3 & 9 & 9 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} -1 & 1 & 2 & 4 & -6 \\ 2 & -2 & 1 & -3 & -3 \\ 0 & 0 & 1 & 1 & -3 \\ -6 & 6 & -3 & 9 & 9 \end{pmatrix} \xrightarrow{\text{line1} \times= (-1)} \begin{pmatrix} 1 & -1 & -2 & -4 & 6 \\ 2 & -2 & 1 & -3 & -3 \\ 0 & 0 & 1 & 1 & -3 \\ -6 & 6 & -3 & 9 & 9 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{-}= \text{line1} \times (2)} \begin{pmatrix} 1 & -1 & -2 & -4 & 6 \\ 0 & 0 & 5 & 5 & -15 \\ 0 & 0 & 1 & 1 & -3 \\ -6 & 6 & -3 & 9 & 9 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line1} \times (6)} \begin{pmatrix} 1 & -1 & -2 & -4 & 6 \\ 0 & 0 & 5 & 5 & -15 \\ 0 & 0 & 1 & 1 & -3 \\ 0 & 0 & -15 & -15 & 45 \end{pmatrix}$$

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

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line2} \times (5)} \begin{pmatrix} 1 & -1 & 0 & -2 & 0 \\ 0 & 0 & 1 & 1 & -3 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -15 & -15 & 45 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2} \times (15)} \begin{pmatrix} 1 & -1 & 0 & -2 & 0 \\ 0 & 0 & 1 & 1 & -3 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 1 & 1 & 5 & -1 & -2 \\ -1 & -1 & -5 & 1 & 9 \\ 1 & 1 & 5 & -1 & -5 \\ 1 & 1 & 5 & -1 & -3 \end{pmatrix} \xrightarrow{\text{line2 += line1}} \begin{pmatrix} 1 & 1 & 5 & -1 & -2 \\ 0 & 0 & 0 & 0 & 7 \\ 1 & 1 & 5 & -1 & -5 \\ 1 & 1 & 5 & -1 & -3 \end{pmatrix} \xrightarrow{\text{line3 -= line1}} \begin{pmatrix} 1 & 1 & 5 & -1 & -2 \\ 0 & 0 & 0 & 0 & 7 \\ 0 & 0 & 0 & 0 & -3 \\ 1 & 1 & 5 & -1 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line1}} \begin{pmatrix} 1 & 1 & 5 & -1 & -2 \\ 0 & 0 & 0 & 0 & 7 \\ 0 & 0 & 0 & 0 & -3 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix} \xrightarrow{\text{line2 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 1 & 5 & -1 & -2 \\ 0 & 0 & 0 & 0 & -1 \\ 0 & 0 & 0 & 0 & -3 \\ 0 & 0 & 0 & 0 & 7 \end{pmatrix}$$

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

$$\xrightarrow{\text{line3 += line2}\times(3)} \begin{pmatrix} 1 & 1 & 5 & -1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 7 \end{pmatrix} \xrightarrow{\text{line4 -= line2}\times(7)} \begin{pmatrix} 1 & 1 & 5 & -1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 2 & 1 & 6 & -1 & -7 \\ -3 & -5 & -9 & -9 & 7 \\ -3 & -4 & -9 & -6 & 8 \\ -1 & 0 & -3 & 2 & 4 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line4}} \begin{pmatrix} -1 & 0 & -3 & 2 & 4 \\ -3 & -5 & -9 & -9 & 7 \\ -3 & -4 & -9 & -6 & 8 \\ 2 & 1 & 6 & -1 & -7 \end{pmatrix} \xrightarrow{\text{line1 } \times = (-1)} \begin{pmatrix} 1 & 0 & 3 & -2 & -4 \\ -3 & -5 & -9 & -9 & 7 \\ -3 & -4 & -9 & -6 & 8 \\ 2 & 1 & 6 & -1 & -7 \end{pmatrix}$$

$$\xrightarrow{\text{line2 += line1}\times(3)} \begin{pmatrix} 1 & 0 & 3 & -2 & -4 \\ 0 & -5 & 0 & -15 & -5 \\ -3 & -4 & -9 & -6 & 8 \\ 2 & 1 & 6 & -1 & -7 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line1}\times(3)} \begin{pmatrix} 1 & 0 & 3 & -2 & -4 \\ 0 & -5 & 0 & -15 & -5 \\ 0 & -4 & 0 & -12 & -4 \\ 2 & 1 & 6 & -1 & -7 \end{pmatrix} \xrightarrow{\text{line4 -= line1}\times(2)} \begin{pmatrix} 1 & 0 & 3 & -2 & -4 \\ 0 & -5 & 0 & -15 & -5 \\ 0 & -4 & 0 & -12 & -4 \\ 0 & 1 & 0 & 3 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 0 & 3 & -2 & -4 \\ 0 & 1 & 0 & 3 & 1 \\ 0 & -4 & 0 & -12 & -4 \\ 0 & -5 & 0 & -15 & -5 \end{pmatrix} \xrightarrow{\text{line3 += line2}\times(4)} \begin{pmatrix} 1 & 0 & 3 & -2 & -4 \\ 0 & 1 & 0 & 3 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -5 & 0 & -15 & -5 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2}\times(5)} \begin{pmatrix} 1 & 0 & 3 & -2 & -4 \\ 0 & 1 & 0 & 3 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -3 & -9 & -9 & -9 & 5 \\ 3 & 9 & 9 & 9 & -1 \\ -2 & -6 & -6 & -6 & 2 \\ -3 & -9 & -9 & -9 & -7 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line3}} \begin{pmatrix} -2 & -6 & -6 & -6 & 2 \\ 3 & 9 & 9 & 9 & -1 \\ -3 & -9 & -9 & -9 & 5 \\ -3 & -9 & -9 & -9 & -7 \end{pmatrix} \xrightarrow{\text{line1 } \times = \left(-\frac{1}{2}\right)} \begin{pmatrix} 1 & 3 & 3 & 3 & -1 \\ 3 & 9 & 9 & 9 & -1 \\ -3 & -9 & -9 & -9 & 5 \\ -3 & -9 & -9 & -9 & -7 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line1}\times(3)} \begin{pmatrix} 1 & 3 & 3 & 3 & -1 \\ 0 & 0 & 0 & 0 & 2 \\ -3 & -9 & -9 & -9 & 5 \\ -3 & -9 & -9 & -9 & -7 \end{pmatrix} \xrightarrow{\text{line3 += line1}\times(3)} \begin{pmatrix} 1 & 3 & 3 & 3 & -1 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 & 2 \\ -3 & -9 & -9 & -9 & -7 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line1}\times(3)} \begin{pmatrix} 1 & 3 & 3 & 3 & -1 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 & -10 \end{pmatrix} \xrightarrow{\text{line2 } \times = \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 3 & 3 & 3 & -1 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 & -10 \end{pmatrix}$$

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

$$\xrightarrow{\text{line4 += line2}\times(10)} \begin{pmatrix} 1 & 3 & 3 & 3 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix}-1&-3&-3&-1&-7\\3&9&9&3&-1\\3&9&9&3&8\\-3&-9&-9&-3&-2\end{pmatrix}\xrightarrow{\text{line1 }\times=(-1)}\begin{pmatrix}1&3&3&1&7\\3&9&9&3&-1\\3&9&9&3&8\\-3&-9&-9&-3&-2\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line1}\times(3)}\begin{pmatrix}1&3&3&1&7\\0&0&0&0&-22\\3&9&9&3&8\\-3&-9&-9&-3&-2\end{pmatrix}$$

$$\xrightarrow{\text{line3 }-=\text{ line1}\times(3)}\begin{pmatrix}1&3&3&1&7\\0&0&0&0&-22\\0&0&0&0&-13\\-3&-9&-9&-3&-2\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line1}\times(3)}\begin{pmatrix}1&3&3&1&7\\0&0&0&0&-22\\0&0&0&0&-13\\0&0&0&0&19\end{pmatrix}$$

$$\xrightarrow{\text{line2 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&3&3&1&7\\0&0&0&0&19\\0&0&0&0&-13\\0&0&0&0&-22\end{pmatrix}\xrightarrow{\text{line2 }\times=\left(\frac{1}{19}\right)}\begin{pmatrix}1&3&3&1&7\\0&0&0&0&1\\0&0&0&0&-13\\0&0&0&0&-22\end{pmatrix}$$

$$\xrightarrow{\text{line1 }-=\text{ line2}\times(7)}\begin{pmatrix}1&3&3&1&0\\0&0&0&0&1\\0&0&0&0&-13\\0&0&0&0&-22\end{pmatrix}\xrightarrow{\text{line3 }+=\text{ line2}\times(13)}\begin{pmatrix}1&3&3&1&0\\0&0&0&0&1\\0&0&0&0&0\\0&0&0&0&-22\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line2}\times(22)}\begin{pmatrix}1&3&3&1&0\\0&0&0&0&1\\0&0&0&0&0\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}1&1&-8&5&-9\\-1&2&-4&-6&-7\\0&2&-3&-4&-9\\0&-1&0&3&4\end{pmatrix}\xrightarrow{\text{line2 }+=\text{ line1}}\begin{pmatrix}1&1&-8&5&-9\\0&3&-12&-1&-16\\0&2&-3&-4&-9\\0&-1&0&3&4\end{pmatrix}\xrightarrow{\text{line2 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&1&-8&5&-9\\0&-1&0&3&4\\0&2&-3&-4&-9\\0&3&-12&-1&-16\end{pmatrix}$$

$$\xrightarrow{\text{line2 }\times=(-1)}\begin{pmatrix}1&1&-8&5&-9\\0&1&0&-3&-4\\0&2&-3&-4&-9\\0&3&-12&-1&-16\end{pmatrix}\xrightarrow{\text{line1 }-=\text{ line2}}\begin{pmatrix}1&0&-8&8&-5\\0&1&0&-3&-4\\0&2&-3&-4&-9\\0&3&-12&-1&-16\end{pmatrix}$$

$$\xrightarrow{\text{line3 }-=\text{ line2}\times(2)}\begin{pmatrix}1&0&-8&8&-5\\0&1&0&-3&-4\\0&0&-3&2&-1\\0&3&-12&-1&-16\end{pmatrix}\xrightarrow{\text{line4 }-=\text{ line2}\times(3)}\begin{pmatrix}1&0&-8&8&-5\\0&1&0&-3&-4\\0&0&-3&2&-1\\0&0&-12&8&-4\end{pmatrix}$$

$$\xrightarrow{\text{line3 }\times=\left(-\frac{1}{3}\right)}\begin{pmatrix}1&0&-8&8&-5\\0&1&0&-3&-4\\0&0&1&-\frac{2}{3}&\frac{1}{3}\\0&0&-12&8&-4\end{pmatrix}\xrightarrow{\text{line1 }+=\text{ line3}\times(8)}\begin{pmatrix}1&0&0&\frac{8}{3}&-\frac{7}{3}\\0&1&0&-3&-4\\0&0&1&-\frac{2}{3}&\frac{1}{3}\\0&0&-12&8&-4\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line3}\times(12)}\begin{pmatrix}1&0&0&\frac{8}{3}&-\frac{7}{3}\\0&1&0&-3&-4\\0&0&1&-\frac{2}{3}&\frac{1}{3}\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix} 2 & 0 & -4 & 1 & 5 \\ -3 & -1 & 5 & 0 & -5 \\ 2 & -2 & -6 & 0 & 2 \\ -2 & 2 & 6 & -1 & -4 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 2 & -2 & -6 & 0 & 2 \\ -3 & -1 & 5 & 0 & -5 \\ 2 & 0 & -4 & 1 & 5 \\ -2 & 2 & 6 & -1 & -4 \end{pmatrix} \xrightarrow{\text{line1} \times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & -1 & -3 & 0 & 1 \\ -3 & -1 & 5 & 0 & -5 \\ 2 & 0 & -4 & 1 & 5 \\ -2 & 2 & 6 & -1 & -4 \end{pmatrix}$$

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

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line1}\times(2)} \begin{pmatrix} 1 & -1 & -3 & 0 & 1 \\ 0 & -4 & -4 & 0 & -2 \\ 0 & 2 & 2 & 1 & 3 \\ 0 & 0 & 0 & -1 & -2 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(-\frac{1}{4}\right)} \begin{pmatrix} 1 & -1 & -3 & 0 & 1 \\ 0 & 1 & 1 & 0 & \frac{1}{2} \\ 0 & 2 & 2 & 1 & 3 \\ 0 & 0 & 0 & -1 & -2 \end{pmatrix}$$

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

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line3}} \begin{pmatrix} 1 & 0 & -2 & 0 & \frac{3}{2} \\ 0 & 1 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -5 & 1 & 3 & 2 & -4 \\ -6 & 1 & -4 & -1 & -1 \\ -7 & 1 & -7 & -2 & 0 \\ 5 & -1 & 3 & 1 & 1 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line2}} \begin{pmatrix} 1 & 0 & 7 & 3 & -3 \\ -6 & 1 & -4 & -1 & -1 \\ -7 & 1 & -7 & -2 & 0 \\ 5 & -1 & 3 & 1 & 1 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{+}= \text{line1}\times(6)} \begin{pmatrix} 1 & 0 & 7 & 3 & -3 \\ 0 & 1 & 38 & 17 & -19 \\ -7 & 1 & -7 & -2 & 0 \\ 5 & -1 & 3 & 1 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{+}= \text{line1}\times(7)} \begin{pmatrix} 1 & 0 & 7 & 3 & -3 \\ 0 & 1 & 38 & 17 & -19 \\ 0 & 1 & 42 & 19 & -21 \\ 5 & -1 & 3 & 1 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line1}\times(5)} \begin{pmatrix} 1 & 0 & 7 & 3 & -3 \\ 0 & 1 & 38 & 17 & -19 \\ 0 & 1 & 42 & 19 & -21 \\ 0 & -1 & -32 & -14 & 16 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line2}} \begin{pmatrix} 1 & 0 & 7 & 3 & -3 \\ 0 & 1 & 38 & 17 & -19 \\ 0 & 0 & 4 & 2 & -2 \\ 0 & -1 & -32 & -14 & 16 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line2}} \begin{pmatrix} 1 & 0 & 7 & 3 & -3 \\ 0 & 1 & 38 & 17 & -19 \\ 0 & 0 & 4 & 2 & -2 \\ 0 & 0 & 6 & 3 & -3 \end{pmatrix} \xrightarrow{\text{line3} \times= \left(\frac{1}{4}\right)} \begin{pmatrix} 1 & 0 & 7 & 3 & -3 \\ 0 & 1 & 38 & 17 & -19 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 6 & 3 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line3}\times(7)} \begin{pmatrix} 1 & 0 & 0 & -\frac{1}{2} & \frac{1}{2} \\ 0 & 1 & 38 & 17 & -19 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 6 & 3 & -3 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line3}\times(38)} \begin{pmatrix} 1 & 0 & 0 & -\frac{1}{2} & \frac{1}{2} \\ 0 & 1 & 0 & -2 & 0 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 6 & 3 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line3}\times(6)} \begin{pmatrix} 1 & 0 & 0 & -\frac{1}{2} & \frac{1}{2} \\ 0 & 1 & 0 & -2 & 0 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -3 & -3 & 1 & -6 & 5 \\ 1 & 1 & -1 & 8 & -1 \\ 0 & 0 & 8 & -5 & -8 \\ 0 & 0 & -9 & 7 & 9 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & 1 & -1 & 8 & -1 \\ -3 & -3 & 1 & -6 & 5 \\ 0 & 0 & 8 & -5 & -8 \\ 0 & 0 & -9 & 7 & 9 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{+}= \text{line1}\times(3)} \begin{pmatrix} 1 & 1 & -1 & 8 & -1 \\ 0 & 0 & -2 & 18 & 2 \\ 0 & 0 & 8 & -5 & -8 \\ 0 & 0 & -9 & 7 & 9 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{\times}= \left(-\frac{1}{2}\right)} \begin{pmatrix} 1 & 1 & -1 & 8 & -1 \\ 0 & 0 & 1 & -9 & -1 \\ 0 & 0 & 8 & -5 & -8 \\ 0 & 0 & -9 & 7 & 9 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line2}} \begin{pmatrix} 1 & 1 & 0 & -1 & -2 \\ 0 & 0 & 1 & -9 & -1 \\ 0 & 0 & 8 & -5 & -8 \\ 0 & 0 & -9 & 7 & 9 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line2}\times(8)} \begin{pmatrix} 1 & 1 & 0 & -1 & -2 \\ 0 & 0 & 1 & -9 & -1 \\ 0 & 0 & 0 & 67 & 0 \\ 0 & 0 & -9 & 7 & 9 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2}\times(9)} \begin{pmatrix} 1 & 1 & 0 & -1 & -2 \\ 0 & 0 & 1 & -9 & -1 \\ 0 & 0 & 0 & 67 & 0 \\ 0 & 0 & 0 & -74 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{\times}= \left(\frac{1}{67}\right)} \begin{pmatrix} 1 & 1 & 0 & -1 & -2 \\ 0 & 0 & 1 & -9 & -1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -74 & 0 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line3}} \begin{pmatrix} 1 & 1 & 0 & 0 & -2 \\ 0 & 0 & 1 & -9 & -1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -74 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line3}\times(9)} \begin{pmatrix} 1 & 1 & 0 & 0 & -2 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -74 & 0 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line3}\times(74)} \begin{pmatrix} 1 & 1 & 0 & 0 & -2 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 0 & -4 & 0 & 2 & -3 \\ -3 & 9 & 1 & -3 & -7 \\ -1 & -5 & 1 & 3 & -9 \\ -1 & -1 & 0 & 1 & -5 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line4}} \begin{pmatrix} -1 & -1 & 0 & 1 & -5 \\ -3 & 9 & 1 & -3 & -7 \\ -1 & -5 & 1 & 3 & -9 \\ 0 & -4 & 0 & 2 & -3 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{\times}= (-1)} \begin{pmatrix} 1 & 1 & 0 & -1 & 5 \\ -3 & 9 & 1 & -3 & -7 \\ -1 & -5 & 1 & 3 & -9 \\ 0 & -4 & 0 & 2 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line1}\times(3)} \begin{pmatrix} 1 & 1 & 0 & -1 & 5 \\ 0 & 12 & 1 & -6 & 8 \\ -1 & -5 & 1 & 3 & -9 \\ 0 & -4 & 0 & 2 & -3 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & 1 & 0 & -1 & 5 \\ 0 & 12 & 1 & -6 & 8 \\ 0 & -4 & 1 & 2 & -4 \\ 0 & -4 & 0 & 2 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line4}} \begin{pmatrix} 1 & 1 & 0 & -1 & 5 \\ 0 & 12 & 1 & -6 & 8 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & -4 & 0 & 2 & -3 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 1 & 0 & -1 & 5 \\ 0 & -4 & 0 & 2 & -3 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 12 & 1 & -6 & 8 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{\times}= \left(-\frac{1}{4}\right)} \begin{pmatrix} 1 & 1 & 0 & -1 & 5 \\ 0 & 1 & 0 & -\frac{1}{2} & \frac{3}{4} \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 12 & 1 & -6 & 8 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line2}} \begin{pmatrix} 1 & 0 & 0 & -\frac{1}{2} & \frac{17}{4} \\ 0 & 1 & 0 & -\frac{1}{2} & \frac{3}{4} \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 12 & 1 & -6 & 8 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{-}= \text{line2}\times(12)} \begin{pmatrix} 1 & 0 & 0 & -\frac{1}{2} & \frac{17}{4} \\ 0 & 1 & 0 & -\frac{1}{2} & \frac{3}{4} \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & 1 & 0 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & -\frac{1}{2} & \frac{17}{4} \\ 0 & 1 & 0 & -\frac{1}{2} & \frac{3}{4} \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix}0&0&0&-8&-2\\1&1&-1&-3&-9\\0&0&0&8&9\\0&0&0&-4&1\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line2}}\begin{pmatrix}1&1&-1&-3&-9\\0&0&0&-8&-2\\0&0&0&8&9\\0&0&0&-4&1\end{pmatrix}\xrightarrow{\text{line2 }+=\text{ line3}}\begin{pmatrix}1&1&-1&-3&-9\\0&0&0&0&7\\0&0&0&8&9\\0&0&0&-4&1\end{pmatrix}$$

$$\xrightarrow{\text{line2 }\leftrightarrow\text{ line3}}\begin{pmatrix}1&1&-1&-3&-9\\0&0&0&8&9\\0&0&0&0&7\\0&0&0&-4&1\end{pmatrix}\xrightarrow{\text{line2 }\times=\left(\frac{1}{8}\right)}\begin{pmatrix}1&1&-1&-3&-9\\0&0&0&1&\frac{9}{8}\\0&0&0&0&7\\0&0&0&-4&1\end{pmatrix}$$

$$\xrightarrow{\text{line1 }+=\text{ line2}\times(3)}\begin{pmatrix}1&1&-1&0&-\frac{45}{8}\\0&0&0&1&\frac{9}{8}\\0&0&0&0&7\\0&0&0&-4&1\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line2}\times(4)}\begin{pmatrix}1&1&-1&0&-\frac{45}{8}\\0&0&0&1&\frac{9}{8}\\0&0&0&0&7\\0&0&0&0&\frac{11}{2}\end{pmatrix}$$

$$\xrightarrow{\text{line3 }\times=\left(\frac{1}{7}\right)}\begin{pmatrix}1&1&-1&0&-\frac{45}{8}\\0&0&0&1&\frac{9}{8}\\0&0&0&0&1\\0&0&0&0&\frac{11}{2}\end{pmatrix}\xrightarrow{\text{line1 }+=\text{ line3}\times\left(\frac{45}{8}\right)}\begin{pmatrix}1&1&-1&0&0\\0&0&0&1&\frac{9}{8}\\0&0&0&0&1\\0&0&0&0&\frac{11}{2}\end{pmatrix}$$

$$\xrightarrow{\text{line2 }-=\text{ line3}\times\left(\frac{9}{8}\right)}\begin{pmatrix}1&1&-1&0&0\\0&0&0&1&0\\0&0&0&0&1\\0&0&0&0&\frac{11}{2}\end{pmatrix}\xrightarrow{\text{line4 }-=\text{ line3}\times\left(\frac{11}{2}\right)}\begin{pmatrix}1&1&-1&0&0\\0&0&0&1&0\\0&0&0&0&1\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}1&1&0&-1&0\\1&1&3&-1&-5\\-6&-6&1&6&5\\-3&-3&-8&3&9\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line1}}\begin{pmatrix}1&1&0&-1&0\\0&0&3&0&-5\\-6&-6&1&6&5\\-3&-3&-8&3&9\end{pmatrix}\xrightarrow{\text{line3 }+=\text{ line1}\times(6)}\begin{pmatrix}1&1&0&-1&0\\0&0&3&0&-5\\0&0&1&0&5\\-3&-3&-8&3&9\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line1}\times(3)}\begin{pmatrix}1&1&0&-1&0\\0&0&3&0&-5\\0&0&1&0&5\\0&0&-8&0&9\end{pmatrix}\xrightarrow{\text{line2 }\leftrightarrow\text{ line3}}\begin{pmatrix}1&1&0&-1&0\\0&0&1&0&5\\0&0&3&0&-5\\0&0&-8&0&9\end{pmatrix}$$

$$\xrightarrow{\text{line3 }-=\text{ line2}\times(3)}\begin{pmatrix}1&1&0&-1&0\\0&0&1&0&5\\0&0&0&0&-20\\0&0&-8&0&9\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line2}\times(8)}\begin{pmatrix}1&1&0&-1&0\\0&0&1&0&5\\0&0&0&0&-20\\0&0&0&0&49\end{pmatrix}$$

$$\xrightarrow{\text{line3 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&1&0&-1&0\\0&0&1&0&5\\0&0&0&0&49\\0&0&0&0&-20\end{pmatrix}\xrightarrow{\text{line3 }\times=\left(\frac{1}{49}\right)}\begin{pmatrix}1&1&0&-1&0\\0&0&1&0&5\\0&0&0&0&1\\0&0&0&0&-20\end{pmatrix}$$

$$\xrightarrow{\text{line2 }-=\text{ line3}\times(5)}\begin{pmatrix}1&1&0&-1&0\\0&0&1&0&0\\0&0&0&0&1\\0&0&0&0&-20\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line3}\times(20)}\begin{pmatrix}1&1&0&-1&0\\0&0&1&0&0\\0&0&0&0&1\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix} -3 & -3 & 0 & 6 & -5 \\ -3 & -7 & 1 & 7 & -6 \\ 3 & -5 & 2 & -4 & 6 \\ -2 & -6 & 1 & 5 & -5 \end{pmatrix} \xrightarrow{\text{line1 -= line2}} \begin{pmatrix} 0 & 4 & -1 & -1 & 1 \\ -3 & -7 & 1 & 7 & -6 \\ 3 & -5 & 2 & -4 & 6 \\ -2 & -6 & 1 & 5 & -5 \end{pmatrix} \xrightarrow{\text{line2 += line3}} \begin{pmatrix} 0 & 4 & -1 & -1 & 1 \\ 0 & -12 & 3 & 3 & 0 \\ 3 & -5 & 2 & -4 & 6 \\ -2 & -6 & 1 & 5 & -5 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line4}} \begin{pmatrix} 0 & 4 & -1 & -1 & 1 \\ 0 & -12 & 3 & 3 & 0 \\ 1 & -11 & 3 & 1 & 1 \\ -2 & -6 & 1 & 5 & -5 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line3}} \begin{pmatrix} 1 & -11 & 3 & 1 & 1 \\ 0 & -12 & 3 & 3 & 0 \\ 0 & 4 & -1 & -1 & 1 \\ -2 & -6 & 1 & 5 & -5 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line1}\times(2)} \begin{pmatrix} 1 & -11 & 3 & 1 & 1 \\ 0 & -12 & 3 & 3 & 0 \\ 0 & 4 & -1 & -1 & 1 \\ 0 & -28 & 7 & 7 & -3 \end{pmatrix} \xrightarrow{\text{line2 } \times= \left(-\frac{1}{12}\right)} \begin{pmatrix} 1 & -11 & 3 & 1 & 1 \\ 0 & 1 & -\frac{1}{4} & -\frac{1}{4} & 0 \\ 0 & 4 & -1 & -1 & 1 \\ 0 & -28 & 7 & 7 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line2}\times(11)} \begin{pmatrix} 1 & 0 & \frac{1}{4} & -\frac{7}{4} & 1 \\ 0 & 1 & -\frac{1}{4} & -\frac{1}{4} & 0 \\ 0 & 4 & -1 & -1 & 1 \\ 0 & -28 & 7 & 7 & -3 \end{pmatrix} \xrightarrow{\text{line3 -= line2}\times(4)} \begin{pmatrix} 1 & 0 & \frac{1}{4} & -\frac{7}{4} & 1 \\ 0 & 1 & -\frac{1}{4} & -\frac{1}{4} & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & -28 & 7 & 7 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2}\times(28)} \begin{pmatrix} 1 & 0 & \frac{1}{4} & -\frac{7}{4} & 1 \\ 0 & 1 & -\frac{1}{4} & -\frac{1}{4} & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -3 \end{pmatrix} \xrightarrow{\text{line1 -= line3}} \begin{pmatrix} 1 & 0 & \frac{1}{4} & -\frac{7}{4} & 0 \\ 0 & 1 & -\frac{1}{4} & -\frac{1}{4} & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line3}\times(3)} \begin{pmatrix} 1 & 0 & \frac{1}{4} & -\frac{7}{4} & 0 \\ 0 & 1 & -\frac{1}{4} & -\frac{1}{4} & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -3 & -1 & -5 & 2 & 5 \\ -2 & 0 & -4 & 1 & 2 \\ 0 & -3 & 3 & 2 & 7 \\ 0 & 3 & -3 & -2 & -7 \end{pmatrix} \xrightarrow{\text{line2 -= line1}} \begin{pmatrix} -3 & -1 & -5 & 2 & 5 \\ 1 & 1 & 1 & -1 & -3 \\ 0 & -3 & 3 & 2 & 7 \\ 0 & 3 & -3 & -2 & -7 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line2}} \begin{pmatrix} 1 & 1 & 1 & -1 & -3 \\ -3 & -1 & -5 & 2 & 5 \\ 0 & -3 & 3 & 2 & 7 \\ 0 & 3 & -3 & -2 & -7 \end{pmatrix}$$

$$\xrightarrow{\text{line2 += line1}\times(3)} \begin{pmatrix} 1 & 1 & 1 & -1 & -3 \\ 0 & 2 & -2 & -1 & -4 \\ 0 & -3 & 3 & 2 & 7 \\ 0 & 3 & -3 & -2 & -7 \end{pmatrix} \xrightarrow{\text{line4 -= line2}} \begin{pmatrix} 1 & 1 & 1 & -1 & -3 \\ 0 & 2 & -2 & -1 & -4 \\ 0 & -3 & 3 & 2 & 7 \\ 0 & 1 & -1 & -1 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 1 & 1 & -1 & -3 \\ 0 & 1 & -1 & -1 & -3 \\ 0 & -3 & 3 & 2 & 7 \\ 0 & 2 & -2 & -1 & -4 \end{pmatrix} \xrightarrow{\text{line1 -= line2}} \begin{pmatrix} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & -1 & -1 & -3 \\ 0 & -3 & 3 & 2 & 7 \\ 0 & 2 & -2 & -1 & -4 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line2}\times(3)} \begin{pmatrix} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & -1 & -1 & -3 \\ 0 & 0 & 0 & -1 & -2 \\ 0 & 2 & -2 & -1 & -4 \end{pmatrix} \xrightarrow{\text{line4 -= line2}\times(2)} \begin{pmatrix} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & -1 & -1 & -3 \\ 0 & 0 & 0 & -1 & -2 \\ 0 & 0 & 0 & 1 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & -1 & -1 & -3 \\ 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & -1 & -2 \end{pmatrix} \xrightarrow{\text{line2 += line3}} \begin{pmatrix} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & -1 & 0 & -1 \\ 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & -1 & -2 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line3}} \begin{pmatrix} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & -1 & 0 & -1 \\ 0 & 0 & 0 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix}-3&0&3&3&-5\\-4&5&4&4&2\\0&-3&0&0&4\\-7&8&7&7&8\end{pmatrix}\xrightarrow{\text{line1 -= line2}}\begin{pmatrix}1&-5&-1&-1&-7\\-4&5&4&4&2\\0&-3&0&0&4\\-7&8&7&7&8\end{pmatrix}\xrightarrow{\text{line2 += line1×(4)}}\begin{pmatrix}1&-5&-1&-1&-7\\0&-15&0&0&-26\\0&-3&0&0&4\\-7&8&7&7&8\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line1×(7)}}\begin{pmatrix}1&-5&-1&-1&-7\\0&-15&0&0&-26\\0&-3&0&0&4\\0&-27&0&0&-41\end{pmatrix}\xrightarrow{\text{line2 ×= }\left(-\frac{1}{15}\right)}\begin{pmatrix}1&-5&-1&-1&-7\\0&1&0&0&\frac{26}{15}\\0&-3&0&0&4\\0&-27&0&0&-41\end{pmatrix}$$

$$\xrightarrow{\text{line1 += line2×(5)}}\begin{pmatrix}1&0&-1&-1&\frac{5}{3}\\0&1&0&0&\frac{26}{15}\\0&-3&0&0&4\\0&-27&0&0&-41\end{pmatrix}\xrightarrow{\text{line3 += line2×(3)}}\begin{pmatrix}1&0&-1&-1&\frac{5}{3}\\0&1&0&0&\frac{26}{15}\\0&0&0&0&\frac{46}{5}\\0&-27&0&0&-41\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2×(27)}}\begin{pmatrix}1&0&-1&-1&\frac{5}{3}\\0&1&0&0&\frac{26}{15}\\0&0&0&0&\frac{46}{5}\\0&0&0&0&\frac{29}{5}\end{pmatrix}\xrightarrow{\text{line3 ×= }\left(\frac{5}{46}\right)}\begin{pmatrix}1&0&-1&-1&\frac{5}{3}\\0&1&0&0&\frac{26}{15}\\0&0&0&0&1\\0&0&0&0&\frac{29}{5}\end{pmatrix}$$

$$\xrightarrow{\text{line1 -= line3×}\left(\frac{5}{3}\right)}\begin{pmatrix}1&0&-1&-1&0\\0&1&0&0&\frac{26}{15}\\0&0&0&0&1\\0&0&0&0&\frac{29}{5}\end{pmatrix}\xrightarrow{\text{line2 -= line3×}\left(\frac{26}{15}\right)}\begin{pmatrix}1&0&-1&-1&0\\0&1&0&0&0\\0&0&0&0&1\\0&0&0&0&\frac{29}{5}\end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line3×}\left(\frac{29}{5}\right)}\begin{pmatrix}1&0&-1&-1&0\\0&1&0&0&0\\0&0&0&0&1\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}-2&0&0&2&8\\-1&-1&3&2&6\\0&-3&9&1&0\\0&0&0&-1&-3\end{pmatrix}\xrightarrow{\text{line1 ↔ line2}}\begin{pmatrix}-1&-1&3&2&6\\-2&0&0&2&8\\0&-3&9&1&0\\0&0&0&-1&-3\end{pmatrix}\xrightarrow{\text{line1 ×= }(-1)}\begin{pmatrix}1&1&-3&-2&-6\\-2&0&0&2&8\\0&-3&9&1&0\\0&0&0&-1&-3\end{pmatrix}$$

$$\xrightarrow{\text{line2 += line1×(2)}}\begin{pmatrix}1&1&-3&-2&-6\\0&2&-6&-2&-4\\0&-3&9&1&0\\0&0&0&-1&-3\end{pmatrix}\xrightarrow{\text{line2 ×= }\left(\frac{1}{2}\right)}\begin{pmatrix}1&1&-3&-2&-6\\0&1&-3&-1&-2\\0&-3&9&1&0\\0&0&0&-1&-3\end{pmatrix}$$

$$\xrightarrow{\text{line1 -= line2}}\begin{pmatrix}1&0&0&-1&-4\\0&1&-3&-1&-2\\0&-3&9&1&0\\0&0&0&-1&-3\end{pmatrix}\xrightarrow{\text{line3 += line2×(3)}}\begin{pmatrix}1&0&0&-1&-4\\0&1&-3&-1&-2\\0&0&0&-2&-6\\0&0&0&-1&-3\end{pmatrix}$$

$$\xrightarrow{\text{line3 ↔ line4}}\begin{pmatrix}1&0&0&-1&-4\\0&1&-3&-1&-2\\0&0&0&-1&-3\\0&0&0&-2&-6\end{pmatrix}\xrightarrow{\text{line3 ×= }(-1)}\begin{pmatrix}1&0&0&-1&-4\\0&1&-3&-1&-2\\0&0&0&1&3\\0&0&0&-2&-6\end{pmatrix}$$

$$\xrightarrow{\text{line1 += line3}}\begin{pmatrix}1&0&0&0&-1\\0&1&-3&-1&-2\\0&0&0&1&3\\0&0&0&-2&-6\end{pmatrix}\xrightarrow{\text{line2 += line3}}\begin{pmatrix}1&0&0&0&-1\\0&1&-3&0&1\\0&0&0&1&3\\0&0&0&-2&-6\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line3×(2)}}\begin{pmatrix}1&0&0&0&-1\\0&1&-3&0&1\\0&0&0&1&3\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}-2&1&2&-4&1\\2&2&-2&-2&9\\1&0&-1&1&-2\\-2&-1&2&0&-6\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line3}}\begin{pmatrix}1&0&-1&1&-2\\2&2&-2&-2&9\\-2&1&2&-4&1\\-2&-1&2&0&-6\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line1}\times(2)}\begin{pmatrix}1&0&-1&1&-2\\0&2&0&-4&13\\-2&1&2&-4&1\\-2&-1&2&0&-6\end{pmatrix}$$

$$\xrightarrow{\text{line3 }+=\text{ line1}\times(2)}\begin{pmatrix}1&0&-1&1&-2\\0&2&0&-4&13\\0&1&0&-2&-3\\-2&-1&2&0&-6\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line1}\times(2)}\begin{pmatrix}1&0&-1&1&-2\\0&2&0&-4&13\\0&1&0&-2&-3\\0&-1&0&2&-10\end{pmatrix}$$

$$\xrightarrow{\text{line2 }\leftrightarrow\text{ line3}}\begin{pmatrix}1&0&-1&1&-2\\0&1&0&-2&-3\\0&2&0&-4&13\\0&-1&0&2&-10\end{pmatrix}\xrightarrow{\text{line3 }-=\text{ line2}\times(2)}\begin{pmatrix}1&0&-1&1&-2\\0&1&0&-2&-3\\0&0&0&0&19\\0&-1&0&2&-10\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line2}}\begin{pmatrix}1&0&-1&1&-2\\0&1&0&-2&-3\\0&0&0&0&19\\0&0&0&0&-13\end{pmatrix}\xrightarrow{\text{line3 }\times=\left(\frac{1}{19}\right)}\begin{pmatrix}1&0&-1&1&-2\\0&1&0&-2&-3\\0&0&0&0&1\\0&0&0&0&-13\end{pmatrix}$$

$$\xrightarrow{\text{line1 }+=\text{ line3}\times(2)}\begin{pmatrix}1&0&-1&1&0\\0&1&0&-2&-3\\0&0&0&0&1\\0&0&0&0&-13\end{pmatrix}\xrightarrow{\text{line2 }+=\text{ line3}\times(3)}\begin{pmatrix}1&0&-1&1&0\\0&1&0&-2&0\\0&0&0&0&1\\0&0&0&0&-13\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line3}\times(13)}\begin{pmatrix}1&0&-1&1&0\\0&1&0&-2&0\\0&0&0&0&1\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}-1&-5&-3&-3&-1\\-3&-3&-6&-3&3\\0&-4&-1&-6&-8\\2&2&4&4&1\end{pmatrix}\xrightarrow{\text{line1 }\times=(-1)}\begin{pmatrix}1&5&3&3&1\\-3&-3&-6&-3&3\\0&-4&-1&-6&-8\\2&2&4&4&1\end{pmatrix}\xrightarrow{\text{line2 }+=\text{ line1}\times(3)}\begin{pmatrix}1&5&3&3&1\\0&12&3&6&6\\0&-4&-1&-6&-8\\2&2&4&4&1\end{pmatrix}$$

$$\xrightarrow{\text{line4 }-=\text{ line1}\times(2)}\begin{pmatrix}1&5&3&3&1\\0&12&3&6&6\\0&-4&-1&-6&-8\\0&-8&-2&-2&-1\end{pmatrix}\xrightarrow{\text{line2 }\times=\left(\frac{1}{12}\right)}\begin{pmatrix}1&5&3&3&1\\0&1&\frac{1}{4}&\frac{1}{2}&\frac{1}{2}\\0&-4&-1&-6&-8\\0&-8&-2&-2&-1\end{pmatrix}$$

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

$$\xrightarrow{\text{line4 }+=\text{ line2}\times(8)}\begin{pmatrix}1&0&\frac{7}{4}&\frac{1}{2}&-\frac{3}{2}\\0&1&\frac{1}{4}&\frac{1}{2}&\frac{1}{2}\\0&0&0&-4&-6\\0&0&0&2&3\end{pmatrix}\xrightarrow{\text{line3 }\times=\left(-\frac{1}{4}\right)}\begin{pmatrix}1&0&\frac{7}{4}&\frac{1}{2}&-\frac{3}{2}\\0&1&\frac{1}{4}&\frac{1}{2}&\frac{1}{2}\\0&0&0&1&\frac{3}{2}\\0&0&0&2&3\end{pmatrix}$$

$$\xrightarrow{\text{line1 }-=\text{ line3}\times\left(\frac{1}{2}\right)}\begin{pmatrix}1&0&\frac{7}{4}&0&-\frac{9}{4}\\0&1&\frac{1}{4}&\frac{1}{2}&\frac{1}{2}\\0&0&0&1&\frac{3}{2}\\0&0&0&2&3\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line3}\times\left(\frac{1}{2}\right)}\begin{pmatrix}1&0&\frac{7}{4}&0&-\frac{9}{4}\\0&1&\frac{1}{4}&0&-\frac{1}{4}\\0&0&0&1&\frac{3}{2}\\0&0&0&2&3\end{pmatrix}$$

$$\xrightarrow{\text{line4 }-=\text{ line3}\times(2)}\begin{pmatrix}1&0&\frac{7}{4}&0&-\frac{9}{4}\\0&1&\frac{1}{4}&0&-\frac{1}{4}\\0&0&0&1&\frac{3}{2}\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix} -1 & -3 & 5 & 1 & 4 \\ 1 & 3 & -5 & -1 & -5 \\ 0 & -1 & 0 & 1 & 2 \\ 0 & -1 & 0 & 1 & 4 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & 3 & -5 & -1 & -5 \\ -1 & -3 & 5 & 1 & 4 \\ 0 & -1 & 0 & 1 & 2 \\ 0 & -1 & 0 & 1 & 4 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & 3 & -5 & -1 & -5 \\ 0 & 0 & 0 & 0 & -1 \\ 0 & -1 & 0 & 1 & 2 \\ 0 & -1 & 0 & 1 & 4 \end{pmatrix}$$

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

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line2}\times(3)} \begin{pmatrix} 1 & 0 & -5 & 2 & 1 \\ 0 & 1 & 0 & -1 & -2 \\ 0 & 0 & 0 & 0 & -1 \\ 0 & -1 & 0 & 1 & 4 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2}} \begin{pmatrix} 1 & 0 & -5 & 2 & 1 \\ 0 & 1 & 0 & -1 & -2 \\ 0 & 0 & 0 & 0 & -1 \\ 0 & 0 & 0 & 0 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 0 & -5 & 2 & 1 \\ 0 & 1 & 0 & -1 & -2 \\ 0 & 0 & 0 & 0 & 2 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{\times}= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & -5 & 2 & 1 \\ 0 & 1 & 0 & -1 & -2 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line3}} \begin{pmatrix} 1 & 0 & -5 & 2 & 0 \\ 0 & 1 & 0 & -1 & -2 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{+}= \text{line3}\times(2)} \begin{pmatrix} 1 & 0 & -5 & 2 & 0 \\ 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line3}} \begin{pmatrix} 1 & 0 & -5 & 2 & 0 \\ 0 & 1 & 0 & -1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 0 & -8 & 8 & 0 & -8 \\ 1 & -5 & 6 & 4 & -7 \\ -1 & 4 & -5 & -4 & 6 \\ 0 & 6 & -7 & 1 & 6 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & -5 & 6 & 4 & -7 \\ 0 & -8 & 8 & 0 & -8 \\ -1 & 4 & -5 & -4 & 6 \\ 0 & 6 & -7 & 1 & 6 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & -5 & 6 & 4 & -7 \\ 0 & -8 & 8 & 0 & -8 \\ 0 & -1 & 1 & 0 & -1 \\ 0 & 6 & -7 & 1 & 6 \end{pmatrix}$$

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

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

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line2}\times(6)} \begin{pmatrix} 1 & 0 & 1 & 4 & -2 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & -1 & 1 & 0 \end{pmatrix} \xrightarrow{\text{line3} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 0 & 1 & 4 & -2 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 0 & -1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{\times}= (-1)} \begin{pmatrix} 1 & 0 & 1 & 4 & -2 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 5 & -2 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 5 & -2 \\ 0 & 1 & 0 & -1 & 1 \\ 0 & 0 & 1 & -1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix}1&-3&-1&9&5\\2&1&-9&4&6\\-1&1&3&-5&-1\\-1&3&1&-9&-9\end{pmatrix}\xrightarrow{\text{line2 -= line1×(2)}}\begin{pmatrix}1&-3&-1&9&5\\0&7&-7&-14&-4\\-1&1&3&-5&-1\\-1&3&1&-9&-9\end{pmatrix}\xrightarrow{\text{line3 += line1}}\begin{pmatrix}1&-3&-1&9&5\\0&7&-7&-14&-4\\0&-2&2&4&4\\-1&3&1&-9&-9\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line1}}\begin{pmatrix}1&-3&-1&9&5\\0&7&-7&-14&-4\\0&-2&2&4&4\\0&0&0&0&-4\end{pmatrix}\xrightarrow{\text{line2 ↔ line3}}\begin{pmatrix}1&-3&-1&9&5\\0&-2&2&4&4\\0&7&-7&-14&-4\\0&0&0&0&-4\end{pmatrix}$$

$$\xrightarrow{\text{line2 ×= }\left(-\frac{1}{2}\right)}\begin{pmatrix}1&-3&-1&9&5\\0&1&-1&-2&-2\\0&7&-7&-14&-4\\0&0&0&0&-4\end{pmatrix}\xrightarrow{\text{line1 += line2×(3)}}\begin{pmatrix}1&0&-4&3&-1\\0&1&-1&-2&-2\\0&7&-7&-14&-4\\0&0&0&0&-4\end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line2×(7)}}\begin{pmatrix}1&0&-4&3&-1\\0&1&-1&-2&-2\\0&0&0&0&10\\0&0&0&0&-4\end{pmatrix}\xrightarrow{\text{line3 ×= }\left(\frac{1}{10}\right)}\begin{pmatrix}1&0&-4&3&-1\\0&1&-1&-2&-2\\0&0&0&0&1\\0&0&0&0&-4\end{pmatrix}$$

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

$$\xrightarrow{\text{line4 += line3×(4)}}\begin{pmatrix}1&0&-4&3&0\\0&1&-1&-2&0\\0&0&0&0&1\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix}1&-3&5&-5&4\\0&0&0&-4&1\\1&-3&5&5&-2\\1&-3&5&5&-1\end{pmatrix}\xrightarrow{\text{line3 -= line1}}\begin{pmatrix}1&-3&5&-5&4\\0&0&0&-4&1\\0&0&0&10&-6\\1&-3&5&5&-1\end{pmatrix}\xrightarrow{\text{line4 -= line1}}\begin{pmatrix}1&-3&5&-5&4\\0&0&0&-4&1\\0&0&0&10&-6\\0&0&0&10&-5\end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line4}}\begin{pmatrix}1&-3&5&-5&4\\0&0&0&-4&1\\0&0&0&0&-1\\0&0&0&10&-5\end{pmatrix}\xrightarrow{\text{line2 ↔ line4}}\begin{pmatrix}1&-3&5&-5&4\\0&0&0&10&-5\\0&0&0&0&-1\\0&0&0&-4&1\end{pmatrix}$$

$$\xrightarrow{\text{line2 ×= }\left(\frac{1}{10}\right)}\begin{pmatrix}1&-3&5&-5&4\\0&0&0&1&-\frac{1}{2}\\0&0&0&0&-1\\0&0&0&-4&1\end{pmatrix}\xrightarrow{\text{line1 += line2×(5)}}\begin{pmatrix}1&-3&5&0&\frac{3}{2}\\0&0&0&1&-\frac{1}{2}\\0&0&0&0&-1\\0&0&0&-4&1\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2×(4)}}\begin{pmatrix}1&-3&5&0&\frac{3}{2}\\0&0&0&1&-\frac{1}{2}\\0&0&0&0&-1\\0&0&0&0&-1\end{pmatrix}\xrightarrow{\text{line3 ×= }(-1)}\begin{pmatrix}1&-3&5&0&\frac{3}{2}\\0&0&0&1&-\frac{1}{2}\\0&0&0&0&1\\0&0&0&0&-1\end{pmatrix}$$

$$\xrightarrow{\text{line1 -= line3×}\left(\frac{3}{2}\right)}\begin{pmatrix}1&-3&5&0&0\\0&0&0&1&-\frac{1}{2}\\0&0&0&0&1\\0&0&0&0&-1\end{pmatrix}\xrightarrow{\text{line2 += line3×}\left(\frac{1}{2}\right)}\begin{pmatrix}1&-3&5&0&0\\0&0&0&1&0\\0&0&0&0&1\\0&0&0&0&-1\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line3}}\begin{pmatrix}1&-3&5&0&0\\0&0&0&1&0\\0&0&0&0&1\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix} 1 & -2 & 0 & 5 & 1 \\ -1 & 0 & 1 & -7 & -5 \\ -6 & 5 & 1 & -4 & -6 \\ 0 & -3 & 1 & 4 & -3 \end{pmatrix} \xrightarrow{\text{line2 += line1}} \begin{pmatrix} 1 & -2 & 0 & 5 & 1 \\ 0 & -2 & 1 & -2 & -4 \\ -6 & 5 & 1 & -4 & -6 \\ 0 & -3 & 1 & 4 & -3 \end{pmatrix} \xrightarrow{\text{line3 += line1×(6)}} \begin{pmatrix} 1 & -2 & 0 & 5 & 1 \\ 0 & -2 & 1 & -2 & -4 \\ 0 & -7 & 1 & 26 & 0 \\ 0 & -3 & 1 & 4 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line4}} \begin{pmatrix} 1 & -2 & 0 & 5 & 1 \\ 0 & 1 & 0 & -6 & -1 \\ 0 & -7 & 1 & 26 & 0 \\ 0 & -3 & 1 & 4 & -3 \end{pmatrix} \xrightarrow{\text{line1 += line2×(2)}} \begin{pmatrix} 1 & 0 & 0 & -7 & -1 \\ 0 & 1 & 0 & -6 & -1 \\ 0 & -7 & 1 & 26 & 0 \\ 0 & -3 & 1 & 4 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line2×(7)}} \begin{pmatrix} 1 & 0 & 0 & -7 & -1 \\ 0 & 1 & 0 & -6 & -1 \\ 0 & 0 & 1 & -16 & -7 \\ 0 & -3 & 1 & 4 & -3 \end{pmatrix} \xrightarrow{\text{line4 += line2×(3)}} \begin{pmatrix} 1 & 0 & 0 & -7 & -1 \\ 0 & 1 & 0 & -6 & -1 \\ 0 & 0 & 1 & -16 & -7 \\ 0 & 0 & 1 & -14 & -6 \end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line3}} \begin{pmatrix} 1 & 0 & 0 & -7 & -1 \\ 0 & 1 & 0 & -6 & -1 \\ 0 & 0 & 1 & -16 & -7 \\ 0 & 0 & 0 & 2 & 1 \end{pmatrix} \xrightarrow{\text{line4 ×= } \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & 0 & -7 & -1 \\ 0 & 1 & 0 & -6 & -1 \\ 0 & 0 & 1 & -16 & -7 \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line4×(7)}} \begin{pmatrix} 1 & 0 & 0 & 0 & \frac{5}{2} \\ 0 & 1 & 0 & -6 & -1 \\ 0 & 0 & 1 & -16 & -7 \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix} \xrightarrow{\text{line2 += line4×(6)}} \begin{pmatrix} 1 & 0 & 0 & 0 & \frac{5}{2} \\ 0 & 1 & 0 & 0 & 2 \\ 0 & 0 & 1 & -16 & -7 \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix} \xrightarrow{\text{line3 += line4×(16)}} \begin{pmatrix} 1 & 0 & 0 & 0 & \frac{5}{2} \\ 0 & 1 & 0 & 0 & 2 \\ 0 & 0 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix}$$

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$$\begin{pmatrix} 1 & -2 & 3 & 1 & -5 \\ 3 & 6 & 9 & 3 & -4 \\ -1 & 5 & -3 & -1 & -5 \\ -1 & -7 & -3 & -1 & -2 \end{pmatrix} \xrightarrow{\text{line2 -= line1×(3)}} \begin{pmatrix} 1 & -2 & 3 & 1 & -5 \\ 0 & 12 & 0 & 0 & 11 \\ -1 & 5 & -3 & -1 & -5 \\ -1 & -7 & -3 & -1 & -2 \end{pmatrix} \xrightarrow{\text{line3 += line1}} \begin{pmatrix} 1 & -2 & 3 & 1 & -5 \\ 0 & 12 & 0 & 0 & 11 \\ 0 & 3 & 0 & 0 & -10 \\ -1 & -7 & -3 & -1 & -2 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line1}} \begin{pmatrix} 1 & -2 & 3 & 1 & -5 \\ 0 & 12 & 0 & 0 & 11 \\ 0 & 3 & 0 & 0 & -10 \\ 0 & -9 & 0 & 0 & -7 \end{pmatrix} \xrightarrow{\text{line2 ×= } \left(\frac{1}{12}\right)} \begin{pmatrix} 1 & -2 & 3 & 1 & -5 \\ 0 & 1 & 0 & 0 & \frac{11}{12} \\ 0 & 3 & 0 & 0 & -10 \\ 0 & -9 & 0 & 0 & -7 \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line2×(2)}} \begin{pmatrix} 1 & 0 & 3 & 1 & -\frac{19}{6} \\ 0 & 1 & 0 & 0 & \frac{11}{12} \\ 0 & 3 & 0 & 0 & -10 \\ 0 & -9 & 0 & 0 & -7 \end{pmatrix} \xrightarrow{\text{line3 -= line2×(3)}} \begin{pmatrix} 1 & 0 & 3 & 1 & -\frac{19}{6} \\ 0 & 1 & 0 & 0 & \frac{11}{12} \\ 0 & 0 & 0 & 0 & -\frac{51}{4} \\ 0 & -9 & 0 & 0 & -7 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2×(9)}} \begin{pmatrix} 1 & 0 & 3 & 1 & -\frac{19}{6} \\ 0 & 1 & 0 & 0 & \frac{11}{12} \\ 0 & 0 & 0 & 0 & -\frac{51}{4} \\ 0 & 0 & 0 & 0 & \frac{5}{4} \end{pmatrix} \xrightarrow{\text{line3 ×= } \left(-\frac{4}{51}\right)} \begin{pmatrix} 1 & 0 & 3 & 1 & -\frac{19}{6} \\ 0 & 1 & 0 & 0 & \frac{11}{12} \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & \frac{5}{4} \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line3×}\left(\frac{19}{6}\right)} \begin{pmatrix} 1 & 0 & 3 & 1 & 0 \\ 0 & 1 & 0 & 0 & \frac{11}{12} \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & \frac{5}{4} \end{pmatrix} \xrightarrow{\text{line2 -= line3×}\left(\frac{11}{12}\right)} \begin{pmatrix} 1 & 0 & 3 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & \frac{5}{4} \end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line3×}\left(\frac{5}{4}\right)} \begin{pmatrix} 1 & 0 & 3 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix}1&0&-8&-5&-4\\2&1&-2&-1&2\\6&3&-5&-3&6\\3&2&3&2&7\end{pmatrix}\xrightarrow{\text{line2 -= line1×(2)}}\begin{pmatrix}1&0&-8&-5&-4\\0&1&14&9&10\\6&3&-5&-3&6\\3&2&3&2&7\end{pmatrix}\xrightarrow{\text{line3 -= line1×(6)}}\begin{pmatrix}1&0&-8&-5&-4\\0&1&14&9&10\\0&3&43&27&30\\3&2&3&2&7\end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line1×(3)}}\begin{pmatrix}1&0&-8&-5&-4\\0&1&14&9&10\\0&3&43&27&30\\0&2&27&17&19\end{pmatrix}\xrightarrow{\text{line3 -= line2×(3)}}\begin{pmatrix}1&0&-8&-5&-4\\0&1&14&9&10\\0&0&1&0&0\\0&2&27&17&19\end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line2×(2)}}\begin{pmatrix}1&0&-8&-5&-4\\0&1&14&9&10\\0&0&1&0&0\\0&0&-1&-1&-1\end{pmatrix}\xrightarrow{\text{line1 += line3×(8)}}\begin{pmatrix}1&0&0&-5&-4\\0&1&14&9&10\\0&0&1&0&0\\0&0&-1&-1&-1\end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line3×(14)}}\begin{pmatrix}1&0&0&-5&-4\\0&1&0&9&10\\0&0&1&0&0\\0&0&-1&-1&-1\end{pmatrix}\xrightarrow{\text{line4 += line3}}\begin{pmatrix}1&0&0&-5&-4\\0&1&0&9&10\\0&0&1&0&0\\0&0&0&-1&-1\end{pmatrix}$$

$$\xrightarrow{\text{line4 ×= (−1)}}\begin{pmatrix}1&0&0&-5&-4\\0&1&0&9&10\\0&0&1&0&0\\0&0&0&1&1\end{pmatrix}\xrightarrow{\text{line1 += line4×(5)}}\begin{pmatrix}1&0&0&0&1\\0&1&0&9&10\\0&0&1&0&0\\0&0&0&1&1\end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line4×(9)}}\begin{pmatrix}1&0&0&0&1\\0&1&0&0&1\\0&0&1&0&0\\0&0&0&1&1\end{pmatrix}$$

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$$\begin{pmatrix}1&0&-3&2&2\\0&0&-2&1&-8\\0&1&1&1&5\\1&-1&-2&0&6\end{pmatrix}\xrightarrow{\text{line4 -= line1}}\begin{pmatrix}1&0&-3&2&2\\0&0&-2&1&-8\\0&1&1&1&5\\0&-1&1&-2&4\end{pmatrix}\xrightarrow{\text{line2 ↔ line3}}\begin{pmatrix}1&0&-3&2&2\\0&1&1&1&5\\0&0&-2&1&-8\\0&-1&1&-2&4\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2}}\begin{pmatrix}1&0&-3&2&2\\0&1&1&1&5\\0&0&-2&1&-8\\0&0&2&-1&9\end{pmatrix}\xrightarrow{\text{line3 += line4}}\begin{pmatrix}1&0&-3&2&2\\0&1&1&1&5\\0&0&0&0&1\\0&0&2&-1&9\end{pmatrix}$$

$$\xrightarrow{\text{line3 ↔ line4}}\begin{pmatrix}1&0&-3&2&2\\0&1&1&1&5\\0&0&2&-1&9\\0&0&0&0&1\end{pmatrix}\xrightarrow{\text{line3 ×= }\left(\frac{1}{2}\right)}\begin{pmatrix}1&0&-3&2&2\\0&1&1&1&5\\0&0&1&-\frac{1}{2}&\frac{9}{2}\\0&0&0&0&1\end{pmatrix}$$

$$\xrightarrow{\text{line1 += line3×(3)}}\begin{pmatrix}1&0&0&\frac{1}{2}&\frac{31}{2}\\0&1&1&1&5\\0&0&1&-\frac{1}{2}&\frac{9}{2}\\0&0&0&0&1\end{pmatrix}\xrightarrow{\text{line2 -= line3}}\begin{pmatrix}1&0&0&\frac{1}{2}&\frac{31}{2}\\0&1&0&\frac{3}{2}&\frac{1}{2}\\0&0&1&-\frac{1}{2}&\frac{9}{2}\\0&0&0&0&1\end{pmatrix}$$

$$\xrightarrow{\text{line1 -= line4×}\left(\frac{31}{2}\right)}\begin{pmatrix}1&0&0&\frac{1}{2}&0\\0&1&0&\frac{3}{2}&\frac{1}{2}\\0&0&1&-\frac{1}{2}&\frac{9}{2}\\0&0&0&0&1\end{pmatrix}\xrightarrow{\text{line2 -= line4×}\left(\frac{1}{2}\right)}\begin{pmatrix}1&0&0&\frac{1}{2}&0\\0&1&0&\frac{3}{2}&0\\0&0&1&-\frac{1}{2}&\frac{9}{2}\\0&0&0&0&1\end{pmatrix}\xrightarrow{\text{line3 -= line4×}\left(\frac{9}{2}\right)}\begin{pmatrix}1&0&0&\frac{1}{2}&0\\0&1&0&\frac{3}{2}&0\\0&0&1&-\frac{1}{2}&0\\0&0&0&0&1\end{pmatrix}$$

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$$\begin{pmatrix}1&2&6&1&-5\\0&-1&3&-2&5\\0&-1&-1&-1&3\\0&3&4&3&-9\end{pmatrix}\xrightarrow{\text{line2 }\times=(-1)}\begin{pmatrix}1&2&6&1&-5\\0&1&-3&2&-5\\0&-1&-1&-1&3\\0&3&4&3&-9\end{pmatrix}\xrightarrow{\text{line1 }-=\text{ line2}\times(2)}\begin{pmatrix}1&0&12&-3&5\\0&1&-3&2&-5\\0&-1&-1&-1&3\\0&3&4&3&-9\end{pmatrix}$$

$$\xrightarrow{\text{line3 }+=\text{ line2}}\begin{pmatrix}1&0&12&-3&5\\0&1&-3&2&-5\\0&0&-4&1&-2\\0&3&4&3&-9\end{pmatrix}\xrightarrow{\text{line4 }-=\text{ line2}\times(3)}\begin{pmatrix}1&0&12&-3&5\\0&1&-3&2&-5\\0&0&-4&1&-2\\0&0&13&-3&6\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line3}\times(3)}\begin{pmatrix}1&0&12&-3&5\\0&1&-3&2&-5\\0&0&-4&1&-2\\0&0&1&0&0\end{pmatrix}\xrightarrow{\text{line3 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&0&12&-3&5\\0&1&-3&2&-5\\0&0&1&0&0\\0&0&-4&1&-2\end{pmatrix}$$

$$\xrightarrow{\text{line1 }-=\text{ line3}\times(12)}\begin{pmatrix}1&0&0&-3&5\\0&1&-3&2&-5\\0&0&1&0&0\\0&0&-4&1&-2\end{pmatrix}\xrightarrow{\text{line2 }+=\text{ line3}\times(3)}\begin{pmatrix}1&0&0&-3&5\\0&1&0&2&-5\\0&0&1&0&0\\0&0&-4&1&-2\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line3}\times(4)}\begin{pmatrix}1&0&0&-3&5\\0&1&0&2&-5\\0&0&1&0&0\\0&0&0&1&-2\end{pmatrix}\xrightarrow{\text{line1 }+=\text{ line4}\times(3)}\begin{pmatrix}1&0&0&0&-1\\0&1&0&2&-5\\0&0&1&0&0\\0&0&0&1&-2\end{pmatrix}$$

$$\xrightarrow{\text{line2 }-=\text{ line4}\times(2)}\begin{pmatrix}1&0&0&0&-1\\0&1&0&0&-1\\0&0&1&0&0\\0&0&0&1&-2\end{pmatrix}$$

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$$\begin{pmatrix}3&-8&-3&4&9\\0&1&0&5&4\\-2&9&2&9&2\\1&-1&-1&7&7\end{pmatrix}\xrightarrow{\text{line1 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&-1&-1&7&7\\0&1&0&5&4\\-2&9&2&9&2\\3&-8&-3&4&9\end{pmatrix}\xrightarrow{\text{line3 }+=\text{ line1}\times(2)}\begin{pmatrix}1&-1&-1&7&7\\0&1&0&5&4\\0&7&0&23&16\\3&-8&-3&4&9\end{pmatrix}$$

$$\xrightarrow{\text{line4 }-=\text{ line1}\times(3)}\begin{pmatrix}1&-1&-1&7&7\\0&1&0&5&4\\0&7&0&23&16\\0&-5&0&-17&-12\end{pmatrix}\xrightarrow{\text{line1 }+=\text{ line2}}\begin{pmatrix}1&0&-1&12&11\\0&1&0&5&4\\0&7&0&23&16\\0&-5&0&-17&-12\end{pmatrix}$$

$$\xrightarrow{\text{line3 }-=\text{ line2}\times(7)}\begin{pmatrix}1&0&-1&12&11\\0&1&0&5&4\\0&0&0&-12&-12\\0&-5&0&-17&-12\end{pmatrix}\xrightarrow{\text{line4 }+=\text{ line2}\times(5)}\begin{pmatrix}1&0&-1&12&11\\0&1&0&5&4\\0&0&0&-12&-12\\0&0&0&8&8\end{pmatrix}$$

$$\xrightarrow{\text{line3 }\leftrightarrow\text{ line4}}\begin{pmatrix}1&0&-1&12&11\\0&1&0&5&4\\0&0&0&8&8\\0&0&0&-12&-12\end{pmatrix}\xrightarrow{\text{line3 }\times=\left(\frac{1}{8}\right)}\begin{pmatrix}1&0&-1&12&11\\0&1&0&5&4\\0&0&0&1&1\\0&0&0&-12&-12\end{pmatrix}$$

$$\xrightarrow{\text{line1 }-=\text{ line3}\times(12)}\begin{pmatrix}1&0&-1&0&-1\\0&1&0&5&4\\0&0&0&1&1\\0&0&0&-12&-12\end{pmatrix}\xrightarrow{\text{line2 }-=\text{ line3}\times(5)}\begin{pmatrix}1&0&-1&0&-1\\0&1&0&0&-1\\0&0&0&1&1\\0&0&0&-12&-12\end{pmatrix}$$

$$\xrightarrow{\text{line4 }+=\text{ line3}\times(12)}\begin{pmatrix}1&0&-1&0&-1\\0&1&0&0&-1\\0&0&0&1&1\\0&0&0&0&0\end{pmatrix}$$

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$$\begin{pmatrix} 3 & 3 & 3 & 9 & -3 \\ -3 & 1 & -1 & -1 & 1 \\ 4 & 1 & 3 & 7 & -3 \\ 5 & -6 & 1 & -4 & -1 \end{pmatrix} \xrightarrow{\text{line1 } \times= \left(\frac{1}{3}\right)} \begin{pmatrix} 1 & 1 & 1 & 3 & -1 \\ -3 & 1 & -1 & -1 & 1 \\ 4 & 1 & 3 & 7 & -3 \\ 5 & -6 & 1 & -4 & -1 \end{pmatrix} \xrightarrow{\text{line2 } += \text{ line1}\times(3)} \begin{pmatrix} 1 & 1 & 1 & 3 & -1 \\ 0 & 4 & 2 & 8 & -2 \\ 4 & 1 & 3 & 7 & -3 \\ 5 & -6 & 1 & -4 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } -= \text{ line1}\times(4)} \begin{pmatrix} 1 & 1 & 1 & 3 & -1 \\ 0 & 4 & 2 & 8 & -2 \\ 0 & -3 & -1 & -5 & 1 \\ 5 & -6 & 1 & -4 & -1 \end{pmatrix} \xrightarrow{\text{line4 } -= \text{ line1}\times(5)} \begin{pmatrix} 1 & 1 & 1 & 3 & -1 \\ 0 & 4 & 2 & 8 & -2 \\ 0 & -3 & -1 & -5 & 1 \\ 0 & -11 & -4 & -19 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } += \text{ line3}} \begin{pmatrix} 1 & 1 & 1 & 3 & -1 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & -3 & -1 & -5 & 1 \\ 0 & -11 & -4 & -19 & 4 \end{pmatrix} \xrightarrow{\text{line1 } -= \text{ line2}} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & -3 & -1 & -5 & 1 \\ 0 & -11 & -4 & -19 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } += \text{ line2}\times(3)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & 0 & 2 & 4 & -2 \\ 0 & -11 & -4 & -19 & 4 \end{pmatrix} \xrightarrow{\text{line4 } += \text{ line2}\times(11)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & 0 & 2 & 4 & -2 \\ 0 & 0 & 7 & 14 & -7 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } \times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & 0 & 1 & 2 & -1 \\ 0 & 0 & 7 & 14 & -7 \end{pmatrix} \xrightarrow{\text{line2 } -= \text{ line3}} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 2 & -1 \\ 0 & 0 & 7 & 14 & -7 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } -= \text{ line3}\times(7)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 2 & -1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -3 & -7 & 3 & 7 & 1 \\ 0 & 1 & 2 & 2 & -2 \\ 0 & 0 & 4 & 3 & 0 \\ -1 & -6 & -1 & -1 & 8 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line4}} \begin{pmatrix} -1 & -6 & -1 & -1 & 8 \\ 0 & 1 & 2 & 2 & -2 \\ 0 & 0 & 4 & 3 & 0 \\ -3 & -7 & 3 & 7 & 1 \end{pmatrix} \xrightarrow{\text{line1 } \times= (-1)} \begin{pmatrix} 1 & 6 & 1 & 1 & -8 \\ 0 & 1 & 2 & 2 & -2 \\ 0 & 0 & 4 & 3 & 0 \\ -3 & -7 & 3 & 7 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } += \text{ line1}\times(3)} \begin{pmatrix} 1 & 6 & 1 & 1 & -8 \\ 0 & 1 & 2 & 2 & -2 \\ 0 & 0 & 4 & 3 & 0 \\ 0 & 11 & 6 & 10 & -23 \end{pmatrix} \xrightarrow{\text{line1 } -= \text{ line2}\times(6)} \begin{pmatrix} 1 & 0 & -11 & -11 & 4 \\ 0 & 1 & 2 & 2 & -2 \\ 0 & 0 & 4 & 3 & 0 \\ 0 & 11 & 6 & 10 & -23 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } -= \text{ line2}\times(11)} \begin{pmatrix} 1 & 0 & -11 & -11 & 4 \\ 0 & 1 & 2 & 2 & -2 \\ 0 & 0 & 4 & 3 & 0 \\ 0 & 0 & -16 & -12 & -1 \end{pmatrix} \xrightarrow{\text{line3 } \times= \left(\frac{1}{4}\right)} \begin{pmatrix} 1 & 0 & -11 & -11 & 4 \\ 0 & 1 & 2 & 2 & -2 \\ 0 & 0 & 1 & \frac{3}{4} & 0 \\ 0 & 0 & -16 & -12 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line1 } += \text{ line3}\times(11)} \begin{pmatrix} 1 & 0 & 0 & -\frac{11}{4} & 4 \\ 0 & 1 & 2 & 2 & -2 \\ 0 & 0 & 1 & \frac{3}{4} & 0 \\ 0 & 0 & -16 & -12 & -1 \end{pmatrix} \xrightarrow{\text{line2 } -= \text{ line3}\times(2)} \begin{pmatrix} 1 & 0 & 0 & -\frac{11}{4} & 4 \\ 0 & 1 & 0 & \frac{1}{2} & -2 \\ 0 & 0 & 1 & \frac{3}{4} & 0 \\ 0 & 0 & -16 & -12 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } += \text{ line3}\times(16)} \begin{pmatrix} 1 & 0 & 0 & -\frac{11}{4} & 4 \\ 0 & 1 & 0 & \frac{1}{2} & -2 \\ 0 & 0 & 1 & \frac{3}{4} & 0 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix} \xrightarrow{\text{line4 } \times= (-1)} \begin{pmatrix} 1 & 0 & 0 & -\frac{11}{4} & 4 \\ 0 & 1 & 0 & \frac{1}{2} & -2 \\ 0 & 0 & 1 & \frac{3}{4} & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line1 } -= \text{ line4}\times(4)} \begin{pmatrix} 1 & 0 & 0 & -\frac{11}{4} & 0 \\ 0 & 1 & 0 & \frac{1}{2} & -2 \\ 0 & 0 & 1 & \frac{3}{4} & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line2 } += \text{ line4}\times(2)} \begin{pmatrix} 1 & 0 & 0 & -\frac{11}{4} & 0 \\ 0 & 1 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 1 & \frac{3}{4} & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{pmatrix} -3 & 2 & -4 & 3 & -4 \\ 6 & -4 & 8 & -6 & 8 \\ -2 & 1 & -3 & 2 & -1 \\ -2 & 1 & -3 & 3 & -1 \end{pmatrix} \xrightarrow{\text{line3 -= line1}} \begin{pmatrix} -3 & 2 & -4 & 3 & -4 \\ 6 & -4 & 8 & -6 & 8 \\ 1 & -1 & 1 & -1 & 3 \\ -2 & 1 & -3 & 3 & -1 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line3}} \begin{pmatrix} 1 & -1 & 1 & -1 & 3 \\ 6 & -4 & 8 & -6 & 8 \\ -3 & 2 & -4 & 3 & -4 \\ -2 & 1 & -3 & 3 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line1}\times(6)} \begin{pmatrix} 1 & -1 & 1 & -1 & 3 \\ 0 & 2 & 2 & 0 & -10 \\ -3 & 2 & -4 & 3 & -4 \\ -2 & 1 & -3 & 3 & -1 \end{pmatrix} \xrightarrow{\text{line3 += line1}\times(3)} \begin{pmatrix} 1 & -1 & 1 & -1 & 3 \\ 0 & 2 & 2 & 0 & -10 \\ 0 & -1 & -1 & 0 & 5 \\ -2 & 1 & -3 & 3 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line1}\times(2)} \begin{pmatrix} 1 & -1 & 1 & -1 & 3 \\ 0 & 2 & 2 & 0 & -10 \\ 0 & -1 & -1 & 0 & 5 \\ 0 & -1 & -1 & 1 & 5 \end{pmatrix} \xrightarrow{\text{line2 } \leftrightarrow \text{ line3}} \begin{pmatrix} 1 & -1 & 1 & -1 & 3 \\ 0 & -1 & -1 & 0 & 5 \\ 0 & 2 & 2 & 0 & -10 \\ 0 & -1 & -1 & 1 & 5 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } \times= (-1)} \begin{pmatrix} 1 & -1 & 1 & -1 & 3 \\ 0 & 1 & 1 & 0 & -5 \\ 0 & 2 & 2 & 0 & -10 \\ 0 & -1 & -1 & 1 & 5 \end{pmatrix} \xrightarrow{\text{line1 += line2}} \begin{pmatrix} 1 & 0 & 2 & -1 & -2 \\ 0 & 1 & 1 & 0 & -5 \\ 0 & 2 & 2 & 0 & -10 \\ 0 & -1 & -1 & 1 & 5 \end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line2}\times(2)} \begin{pmatrix} 1 & 0 & 2 & -1 & -2 \\ 0 & 1 & 1 & 0 & -5 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & -1 & -1 & 1 & 5 \end{pmatrix} \xrightarrow{\text{line4 += line2}} \begin{pmatrix} 1 & 0 & 2 & -1 & -2 \\ 0 & 1 & 1 & 0 & -5 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 0 & 2 & -1 & -2 \\ 0 & 1 & 1 & 0 & -5 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line1 += line3}} \begin{pmatrix} 1 & 0 & 2 & 0 & -2 \\ 0 & 1 & 1 & 0 & -5 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -1 & 2 & 8 & 0 & -1 \\ -1 & -4 & 2 & 1 & -1 \\ -3 & -9 & 9 & 3 & -3 \\ 2 & 7 & -5 & -2 & 2 \end{pmatrix} \xrightarrow{\text{line1 } \times= (-1)} \begin{pmatrix} 1 & -2 & -8 & 0 & 1 \\ -1 & -4 & 2 & 1 & -1 \\ -3 & -9 & 9 & 3 & -3 \\ 2 & 7 & -5 & -2 & 2 \end{pmatrix} \xrightarrow{\text{line2 += line1}} \begin{pmatrix} 1 & -2 & -8 & 0 & 1 \\ 0 & -6 & -6 & 1 & 0 \\ -3 & -9 & 9 & 3 & -3 \\ 2 & 7 & -5 & -2 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line1}\times(3)} \begin{pmatrix} 1 & -2 & -8 & 0 & 1 \\ 0 & -6 & -6 & 1 & 0 \\ 0 & -15 & -15 & 3 & 0 \\ 2 & 7 & -5 & -2 & 2 \end{pmatrix} \xrightarrow{\text{line4 -= line1}\times(2)} \begin{pmatrix} 1 & -2 & -8 & 0 & 1 \\ 0 & -6 & -6 & 1 & 0 \\ 0 & -15 & -15 & 3 & 0 \\ 0 & 11 & 11 & -2 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2}\times(2)} \begin{pmatrix} 1 & -2 & -8 & 0 & 1 \\ 0 & -6 & -6 & 1 & 0 \\ 0 & -15 & -15 & 3 & 0 \\ 0 & -1 & -1 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line2 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & -2 & -8 & 0 & 1 \\ 0 & -1 & -1 & 0 & 0 \\ 0 & -15 & -15 & 3 & 0 \\ 0 & -6 & -6 & 1 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } \times= (-1)} \begin{pmatrix} 1 & -2 & -8 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & -15 & -15 & 3 & 0 \\ 0 & -6 & -6 & 1 & 0 \end{pmatrix} \xrightarrow{\text{line1 += line2}\times(2)} \begin{pmatrix} 1 & 0 & -6 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & -15 & -15 & 3 & 0 \\ 0 & -6 & -6 & 1 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line2}\times(15)} \begin{pmatrix} 1 & 0 & -6 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 3 & 0 \\ 0 & -6 & -6 & 1 & 0 \end{pmatrix} \xrightarrow{\text{line4 += line2}\times(6)} \begin{pmatrix} 1 & 0 & -6 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 3 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 0 & -6 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 3 & 0 \end{pmatrix} \xrightarrow{\text{line4 -= line3}\times(3)} \begin{pmatrix} 1 & 0 & -6 & 0 & 1 \\ 0 & 1 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 0 & -8 & 1 & -7 & -8 \\ -1 & 3 & 1 & 3 & -1 \\ 1 & -9 & -1 & -9 & -5 \\ -3 & 9 & 2 & 8 & -4 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -9 & -1 & -9 & -5 \\ -1 & 3 & 1 & 3 & -1 \\ 0 & -8 & 1 & -7 & -8 \\ -3 & 9 & 2 & 8 & -4 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & -9 & -1 & -9 & -5 \\ 0 & -6 & 0 & -6 & -6 \\ 0 & -8 & 1 & -7 & -8 \\ -3 & 9 & 2 & 8 & -4 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line1}\times(3)} \begin{pmatrix} 1 & -9 & -1 & -9 & -5 \\ 0 & -6 & 0 & -6 & -6 \\ 0 & -8 & 1 & -7 & -8 \\ 0 & -18 & -1 & -19 & -19 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \times= \left(-\frac{1}{6}\right)} \begin{pmatrix} 1 & -9 & -1 & -9 & -5 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & -8 & 1 & -7 & -8 \\ 0 & -18 & -1 & -19 & -19 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line2}\times(9)} \begin{pmatrix} 1 & 0 & -1 & 0 & 4 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & -8 & 1 & -7 & -8 \\ 0 & -18 & -1 & -19 & -19 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{+}= \text{line2}\times(8)} \begin{pmatrix} 1 & 0 & -1 & 0 & 4 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & -18 & -1 & -19 & -19 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2}\times(18)} \begin{pmatrix} 1 & 0 & -1 & 0 & 4 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & -1 & -1 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{+}= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 1 & 4 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & -1 & -1 & -1 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 1 & 4 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \times= (-1)} \begin{pmatrix} 1 & 0 & 0 & 1 & 4 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line4}\times(4)} \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{-}= \text{line4}} \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{pmatrix} 0 & 5 & -1 & -1 & 2 \\ -1 & -4 & 2 & 0 & 3 \\ -1 & 4 & 1 & -1 & 8 \\ -1 & 9 & -1 & -3 & 7 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} -1 & -4 & 2 & 0 & 3 \\ 0 & 5 & -1 & -1 & 2 \\ -1 & 4 & 1 & -1 & 8 \\ -1 & 9 & -1 & -3 & 7 \end{pmatrix} \xrightarrow{\text{line1} \times= (-1)} \begin{pmatrix} 1 & 4 & -2 & 0 & -3 \\ 0 & 5 & -1 & -1 & 2 \\ -1 & 4 & 1 & -1 & 8 \\ -1 & 9 & -1 & -3 & 7 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & 4 & -2 & 0 & -3 \\ 0 & 5 & -1 & -1 & 2 \\ 0 & 8 & -1 & -1 & 5 \\ -1 & 9 & -1 & -3 & 7 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & 4 & -2 & 0 & -3 \\ 0 & 5 & -1 & -1 & 2 \\ 0 & 8 & -1 & -1 & 5 \\ 0 & 13 & -3 & -3 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \times= \left(\frac{1}{5}\right)} \begin{pmatrix} 1 & 4 & -2 & 0 & -3 \\ 0 & 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{2}{5} \\ 0 & 8 & -1 & -1 & 5 \\ 0 & 13 & -3 & -3 & 4 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line2}\times(4)} \begin{pmatrix} 1 & 0 & -\frac{6}{5} & \frac{4}{5} & -\frac{23}{5} \\ 0 & 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{2}{5} \\ 0 & 8 & -1 & -1 & 5 \\ 0 & 13 & -3 & -3 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line2}\times(8)} \begin{pmatrix} 1 & 0 & -\frac{6}{5} & \frac{4}{5} & -\frac{23}{5} \\ 0 & 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{2}{5} \\ 0 & 0 & \frac{3}{5} & \frac{3}{5} & \frac{9}{5} \\ 0 & 13 & -3 & -3 & 4 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{-}= \text{line2}\times(13)} \begin{pmatrix} 1 & 0 & -\frac{6}{5} & \frac{4}{5} & -\frac{23}{5} \\ 0 & 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{2}{5} \\ 0 & 0 & \frac{3}{5} & \frac{3}{5} & \frac{9}{5} \\ 0 & 0 & -\frac{2}{5} & -\frac{2}{5} & -\frac{6}{5} \end{pmatrix}$$

$$\xrightarrow{\text{line3} \times= \left(\frac{5}{3}\right)} \begin{pmatrix} 1 & 0 & -\frac{6}{5} & \frac{4}{5} & -\frac{23}{5} \\ 0 & 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{2}{5} \\ 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & -\frac{2}{5} & -\frac{2}{5} & -\frac{6}{5} \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line3}\times\left(\frac{6}{5}\right)} \begin{pmatrix} 1 & 0 & 0 & 2 & -1 \\ 0 & 1 & -\frac{1}{5} & -\frac{1}{5} & \frac{2}{5} \\ 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & -\frac{2}{5} & -\frac{2}{5} & -\frac{6}{5} \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line3}\times\left(\frac{1}{5}\right)} \begin{pmatrix} 1 & 0 & 0 & 2 & -1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & -\frac{2}{5} & -\frac{2}{5} & -\frac{6}{5} \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line3}\times\left(\frac{2}{5}\right)} \begin{pmatrix} 1 & 0 & 0 & 2 & -1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 1 & -3 & -4 & -8 & 0 \\ -2 & 1 & 4 & 2 & 8 \\ 3 & -3 & -7 & -7 & -9 \\ -2 & -2 & 0 & -8 & 8 \end{pmatrix} \xrightarrow{\text{line2 += line1×(2)}} \begin{pmatrix} 1 & -3 & -4 & -8 & 0 \\ 0 & -5 & -4 & -14 & 8 \\ 3 & -3 & -7 & -7 & -9 \\ -2 & -2 & 0 & -8 & 8 \end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line1×(3)}} \begin{pmatrix} 1 & -3 & -4 & -8 & 0 \\ 0 & -5 & -4 & -14 & 8 \\ 0 & 6 & 5 & 17 & -9 \\ -2 & -2 & 0 & -8 & 8 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line1×(2)}} \begin{pmatrix} 1 & -3 & -4 & -8 & 0 \\ 0 & -5 & -4 & -14 & 8 \\ 0 & 6 & 5 & 17 & -9 \\ 0 & -8 & -8 & -24 & 8 \end{pmatrix} \xrightarrow{\text{line2 ↔ line4}} \begin{pmatrix} 1 & -3 & -4 & -8 & 0 \\ 0 & -8 & -8 & -24 & 8 \\ 0 & 6 & 5 & 17 & -9 \\ 0 & -5 & -4 & -14 & 8 \end{pmatrix}$$

$$\xrightarrow{\text{line2 ×= } \left(-\frac{1}{8}\right)} \begin{pmatrix} 1 & -3 & -4 & -8 & 0 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & 6 & 5 & 17 & -9 \\ 0 & -5 & -4 & -14 & 8 \end{pmatrix} \xrightarrow{\text{line1 += line2×(3)}} \begin{pmatrix} 1 & 0 & -1 & 1 & -3 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & 6 & 5 & 17 & -9 \\ 0 & -5 & -4 & -14 & 8 \end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line2×(6)}} \begin{pmatrix} 1 & 0 & -1 & 1 & -3 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & 0 & -1 & -1 & -3 \\ 0 & -5 & -4 & -14 & 8 \end{pmatrix} \xrightarrow{\text{line4 += line2×(5)}} \begin{pmatrix} 1 & 0 & -1 & 1 & -3 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & 0 & -1 & -1 & -3 \\ 0 & 0 & 1 & 1 & 3 \end{pmatrix}$$

$$\xrightarrow{\text{line3 ↔ line4}} \begin{pmatrix} 1 & 0 & -1 & 1 & -3 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & -1 & -1 & -3 \end{pmatrix} \xrightarrow{\text{line1 += line3}} \begin{pmatrix} 1 & 0 & 0 & 2 & 0 \\ 0 & 1 & 1 & 3 & -1 \\ 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & -1 & -1 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line3}} \begin{pmatrix} 1 & 0 & 0 & 2 & 0 \\ 0 & 1 & 0 & 2 & -4 \\ 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & -1 & -1 & -3 \end{pmatrix} \xrightarrow{\text{line4 += line3}} \begin{pmatrix} 1 & 0 & 0 & 2 & 0 \\ 0 & 1 & 0 & 2 & -4 \\ 0 & 0 & 1 & 1 & 3 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 1 & 2 & 6 & 2 & -9 \\ -2 & -1 & -5 & -7 & 6 \\ -1 & 2 & 4 & -6 & -7 \\ 1 & -1 & -1 & 5 & 3 \end{pmatrix} \xrightarrow{\text{line2 += line1×(2)}} \begin{pmatrix} 1 & 2 & 6 & 2 & -9 \\ 0 & 3 & 7 & -3 & -12 \\ -1 & 2 & 4 & -6 & -7 \\ 1 & -1 & -1 & 5 & 3 \end{pmatrix} \xrightarrow{\text{line3 += line1}} \begin{pmatrix} 1 & 2 & 6 & 2 & -9 \\ 0 & 3 & 7 & -3 & -12 \\ 0 & 4 & 10 & -4 & -16 \\ 1 & -1 & -1 & 5 & 3 \end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line1}} \begin{pmatrix} 1 & 2 & 6 & 2 & -9 \\ 0 & 3 & 7 & -3 & -12 \\ 0 & 4 & 10 & -4 & -16 \\ 0 & -3 & -7 & 3 & 12 \end{pmatrix} \xrightarrow{\text{line3 -= line2}} \begin{pmatrix} 1 & 2 & 6 & 2 & -9 \\ 0 & 3 & 7 & -3 & -12 \\ 0 & 1 & 3 & -1 & -4 \\ 0 & -3 & -7 & 3 & 12 \end{pmatrix}$$

$$\xrightarrow{\text{line2 ↔ line3}} \begin{pmatrix} 1 & 2 & 6 & 2 & -9 \\ 0 & 1 & 3 & -1 & -4 \\ 0 & 3 & 7 & -3 & -12 \\ 0 & -3 & -7 & 3 & 12 \end{pmatrix} \xrightarrow{\text{line1 -= line2×(2)}} \begin{pmatrix} 1 & 0 & 0 & 4 & -1 \\ 0 & 1 & 3 & -1 & -4 \\ 0 & 3 & 7 & -3 & -12 \\ 0 & -3 & -7 & 3 & 12 \end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line2×(3)}} \begin{pmatrix} 1 & 0 & 0 & 4 & -1 \\ 0 & 1 & 3 & -1 & -4 \\ 0 & 0 & -2 & 0 & 0 \\ 0 & -3 & -7 & 3 & 12 \end{pmatrix} \xrightarrow{\text{line4 += line2×(3)}} \begin{pmatrix} 1 & 0 & 0 & 4 & -1 \\ 0 & 1 & 3 & -1 & -4 \\ 0 & 0 & -2 & 0 & 0 \\ 0 & 0 & 2 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3 ↔ line4}} \begin{pmatrix} 1 & 0 & 0 & 4 & -1 \\ 0 & 1 & 3 & -1 & -4 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & -2 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line3 ×= } \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & 0 & 4 & -1 \\ 0 & 1 & 3 & -1 & -4 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & -2 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line3×(3)}} \begin{pmatrix} 1 & 0 & 0 & 4 & -1 \\ 0 & 1 & 0 & -1 & -4 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & -2 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line4 += line3×(2)}} \begin{pmatrix} 1 & 0 & 0 & 4 & -1 \\ 0 & 1 & 0 & -1 & -4 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 1 & 8 & -3 & 8 & 7 \\ 1 & -9 & 3 & -9 & -3 \\ 0 & 1 & 0 & 1 & 3 \\ -1 & 3 & -2 & 3 & -8 \end{pmatrix} \xrightarrow{\text{line2 } -= \text{ line1}} \begin{pmatrix} 1 & 8 & -3 & 8 & 7 \\ 0 & -17 & 6 & -17 & -10 \\ 0 & 1 & 0 & 1 & 3 \\ -1 & 3 & -2 & 3 & -8 \end{pmatrix} \xrightarrow{\text{line4 } += \text{ line1}} \begin{pmatrix} 1 & 8 & -3 & 8 & 7 \\ 0 & -17 & 6 & -17 & -10 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 11 & -5 & 11 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } \leftrightarrow \text{ line3}} \begin{pmatrix} 1 & 8 & -3 & 8 & 7 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & -17 & 6 & -17 & -10 \\ 0 & 11 & -5 & 11 & -1 \end{pmatrix} \xrightarrow{\text{line1 } -= \text{ line2}\times(8)} \begin{pmatrix} 1 & 0 & -3 & 0 & -17 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & -17 & 6 & -17 & -10 \\ 0 & 11 & -5 & 11 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } += \text{ line2}\times(17)} \begin{pmatrix} 1 & 0 & -3 & 0 & -17 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 6 & 0 & 41 \\ 0 & 11 & -5 & 11 & -1 \end{pmatrix} \xrightarrow{\text{line4 } -= \text{ line2}\times(11)} \begin{pmatrix} 1 & 0 & -3 & 0 & -17 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 6 & 0 & 41 \\ 0 & 0 & -5 & 0 & -34 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } += \text{ line4}} \begin{pmatrix} 1 & 0 & -3 & 0 & -17 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 1 & 0 & 7 \\ 0 & 0 & -5 & 0 & -34 \end{pmatrix} \xrightarrow{\text{line1 } += \text{ line3}\times(3)} \begin{pmatrix} 1 & 0 & 0 & 0 & 4 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 1 & 0 & 7 \\ 0 & 0 & -5 & 0 & -34 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } += \text{ line3}\times(5)} \begin{pmatrix} 1 & 0 & 0 & 0 & 4 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 1 & 0 & 7 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line1 } -= \text{ line4}\times(4)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 1 & 0 & 7 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } -= \text{ line4}\times(3)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 7 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line3 } -= \text{ line4}\times(7)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{pmatrix} 2 & 0 & -1 & 0 & 6 \\ 1 & 1 & -2 & -1 & 1 \\ 3 & 5 & -9 & -1 & 3 \\ -1 & -3 & 5 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line2}} \begin{pmatrix} 1 & 1 & -2 & -1 & 1 \\ 2 & 0 & -1 & 0 & 6 \\ 3 & 5 & -9 & -1 & 3 \\ -1 & -3 & 5 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line2 } -= \text{ line1}\times(2)} \begin{pmatrix} 1 & 1 & -2 & -1 & 1 \\ 0 & -2 & 3 & 2 & 4 \\ 3 & 5 & -9 & -1 & 3 \\ -1 & -3 & 5 & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } -= \text{ line1}\times(3)} \begin{pmatrix} 1 & 1 & -2 & -1 & 1 \\ 0 & -2 & 3 & 2 & 4 \\ 0 & 2 & -3 & 2 & 0 \\ -1 & -3 & 5 & 0 & 0 \end{pmatrix} \xrightarrow{\text{line4 } += \text{ line1}} \begin{pmatrix} 1 & 1 & -2 & -1 & 1 \\ 0 & -2 & 3 & 2 & 4 \\ 0 & 2 & -3 & 2 & 0 \\ 0 & -2 & 3 & -1 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } += \text{ line3}} \begin{pmatrix} 1 & 1 & -2 & -1 & 1 \\ 0 & 0 & 0 & 4 & 4 \\ 0 & 2 & -3 & 2 & 0 \\ 0 & -2 & 3 & -1 & 1 \end{pmatrix} \xrightarrow{\text{line3 } += \text{ line4}} \begin{pmatrix} 1 & 1 & -2 & -1 & 1 \\ 0 & 0 & 0 & 4 & 4 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & -2 & 3 & -1 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 1 & -2 & -1 & 1 \\ 0 & -2 & 3 & -1 & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 4 & 4 \end{pmatrix} \xrightarrow{\text{line2 } \times= \left(-\frac{1}{2}\right)} \begin{pmatrix} 1 & 1 & -2 & -1 & 1 \\ 0 & 1 & -\frac{3}{2} & \frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 4 & 4 \end{pmatrix}$$

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

$$\xrightarrow{\text{line2 } -= \text{ line3}\times\left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & -\frac{1}{2} & 0 & 3 \\ 0 & 1 & -\frac{3}{2} & 0 & -1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 4 & 4 \end{pmatrix} \xrightarrow{\text{line4 } -= \text{ line3}\times(4)} \begin{pmatrix} 1 & 0 & -\frac{1}{2} & 0 & 3 \\ 0 & 1 & -\frac{3}{2} & 0 & -1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 2 & 6 & 4 & 5 & 4 \\ -1 & -9 & 1 & 2 & -5 \\ 0 & -4 & 2 & 0 & -2 \\ -1 & -9 & 1 & 5 & -5 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line4}} \begin{pmatrix} -1 & -9 & 1 & 5 & -5 \\ -1 & -9 & 1 & 2 & -5 \\ 0 & -4 & 2 & 0 & -2 \\ 2 & 6 & 4 & 5 & 4 \end{pmatrix} \xrightarrow{\text{line1} \times= (-1)} \begin{pmatrix} 1 & 9 & -1 & -5 & 5 \\ -1 & -9 & 1 & 2 & -5 \\ 0 & -4 & 2 & 0 & -2 \\ 2 & 6 & 4 & 5 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & 9 & -1 & -5 & 5 \\ 0 & 0 & 0 & -3 & 0 \\ 0 & -4 & 2 & 0 & -2 \\ 2 & 6 & 4 & 5 & 4 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{-}= \text{line1} \times (2)} \begin{pmatrix} 1 & 9 & -1 & -5 & 5 \\ 0 & 0 & 0 & -3 & 0 \\ 0 & -4 & 2 & 0 & -2 \\ 0 & -12 & 6 & 15 & -6 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 9 & -1 & -5 & 5 \\ 0 & -4 & 2 & 0 & -2 \\ 0 & 0 & 0 & -3 & 0 \\ 0 & -12 & 6 & 15 & -6 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(-\frac{1}{4}\right)} \begin{pmatrix} 1 & 9 & -1 & -5 & 5 \\ 0 & 1 & -\frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 0 & 0 & -3 & 0 \\ 0 & -12 & 6 & 15 & -6 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line2} \times (9)} \begin{pmatrix} 1 & 0 & \frac{7}{2} & -5 & \frac{1}{2} \\ 0 & 1 & -\frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 0 & 0 & -3 & 0 \\ 0 & -12 & 6 & 15 & -6 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2} \times (12)} \begin{pmatrix} 1 & 0 & \frac{7}{2} & -5 & \frac{1}{2} \\ 0 & 1 & -\frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 0 & 0 & -3 & 0 \\ 0 & 0 & 0 & 15 & 0 \end{pmatrix} \xrightarrow{\text{line3} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 0 & \frac{7}{2} & -5 & \frac{1}{2} \\ 0 & 1 & -\frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 15 & 0 \\ 0 & 0 & 0 & -3 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \times= \left(\frac{1}{15}\right)} \begin{pmatrix} 1 & 0 & \frac{7}{2} & -5 & \frac{1}{2} \\ 0 & 1 & -\frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -3 & 0 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line3} \times (5)} \begin{pmatrix} 1 & 0 & \frac{7}{2} & 0 & \frac{1}{2} \\ 0 & 1 & -\frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & -3 & 0 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line3} \times (3)} \begin{pmatrix} 1 & 0 & \frac{7}{2} & 0 & \frac{1}{2} \\ 0 & 1 & -\frac{1}{2} & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 5 & -5 & 5 & -5 & 3 \\ 2 & -2 & 6 & 0 & 1 \\ -5 & 5 & -1 & 7 & -3 \\ 0 & 0 & -8 & -4 & 0 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line3}} \begin{pmatrix} 0 & 0 & 4 & 2 & 0 \\ 2 & -2 & 6 & 0 & 1 \\ -5 & 5 & -1 & 7 & -3 \\ 0 & 0 & -8 & -4 & 0 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line2} \times (3)} \begin{pmatrix} 0 & 0 & 4 & 2 & 0 \\ 2 & -2 & 6 & 0 & 1 \\ 1 & -1 & 17 & 7 & 0 \\ 0 & 0 & -8 & -4 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -1 & 17 & 7 & 0 \\ 2 & -2 & 6 & 0 & 1 \\ 0 & 0 & 4 & 2 & 0 \\ 0 & 0 & -8 & -4 & 0 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line1} \times (2)} \begin{pmatrix} 1 & -1 & 17 & 7 & 0 \\ 0 & 0 & -28 & -14 & 1 \\ 0 & 0 & 4 & 2 & 0 \\ 0 & 0 & -8 & -4 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \times= \left(-\frac{1}{28}\right)} \begin{pmatrix} 1 & -1 & 17 & 7 & 0 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{28} \\ 0 & 0 & 4 & 2 & 0 \\ 0 & 0 & -8 & -4 & 0 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line2} \times (17)} \begin{pmatrix} 1 & -1 & 0 & -\frac{3}{2} & \frac{17}{28} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{28} \\ 0 & 0 & 4 & 2 & 0 \\ 0 & 0 & -8 & -4 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line2} \times (4)} \begin{pmatrix} 1 & -1 & 0 & -\frac{3}{2} & \frac{17}{28} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{28} \\ 0 & 0 & 0 & 0 & \frac{1}{7} \\ 0 & 0 & -8 & -4 & 0 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2} \times (8)} \begin{pmatrix} 1 & -1 & 0 & -\frac{3}{2} & \frac{17}{28} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{28} \\ 0 & 0 & 0 & 0 & \frac{1}{7} \\ 0 & 0 & 0 & 0 & -\frac{2}{7} \end{pmatrix}$$

$$\xrightarrow{\text{line3} \times= (7)} \begin{pmatrix} 1 & -1 & 0 & -\frac{3}{2} & \frac{17}{28} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{28} \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -\frac{2}{7} \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line3} \times \left(\frac{17}{28}\right)} \begin{pmatrix} 1 & -1 & 0 & -\frac{3}{2} & 0 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{28} \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -\frac{2}{7} \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line3} \times \left(\frac{1}{28}\right)} \begin{pmatrix} 1 & -1 & 0 & -\frac{3}{2} & 0 \\ 0 & 0 & 1 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -\frac{2}{7} \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line3} \times \left(\frac{2}{7}\right)} \begin{pmatrix} 1 & -1 & 0 & -\frac{3}{2} & 0 \\ 0 & 0 & 1 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 8 & 0 & -3 & -8 & 9 \\ 2 & 4 & -1 & -5 & 0 \\ 1 & 7 & 1 & 1 & -1 \\ -2 & -8 & -1 & -1 & 0 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 7 & 1 & 1 & -1 \\ 2 & 4 & -1 & -5 & 0 \\ 8 & 0 & -3 & -8 & 9 \\ -2 & -8 & -1 & -1 & 0 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line1}\times(2)} \begin{pmatrix} 1 & 7 & 1 & 1 & -1 \\ 0 & -10 & -3 & -7 & 2 \\ 8 & 0 & -3 & -8 & 9 \\ -2 & -8 & -1 & -1 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line1}\times(8)} \begin{pmatrix} 1 & 7 & 1 & 1 & -1 \\ 0 & -10 & -3 & -7 & 2 \\ 0 & -56 & -11 & -16 & 17 \\ -2 & -8 & -1 & -1 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line1}\times(2)} \begin{pmatrix} 1 & 7 & 1 & 1 & -1 \\ 0 & -10 & -3 & -7 & 2 \\ 0 & -56 & -11 & -16 & 17 \\ 0 & 6 & 1 & 1 & -2 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(-\frac{1}{10}\right)} \begin{pmatrix} 1 & 7 & 1 & 1 & -1 \\ 0 & 1 & \frac{3}{10} & \frac{7}{10} & -\frac{1}{5} \\ 0 & -56 & -11 & -16 & 17 \\ 0 & 6 & 1 & 1 & -2 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line2}\times(7)} \begin{pmatrix} 1 & 0 & -\frac{11}{10} & -\frac{39}{10} & \frac{2}{5} \\ 0 & 1 & \frac{3}{10} & \frac{7}{10} & -\frac{1}{5} \\ 0 & -56 & -11 & -16 & 17 \\ 0 & 6 & 1 & 1 & -2 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line2}\times(56)} \begin{pmatrix} 1 & 0 & -\frac{11}{10} & -\frac{39}{10} & \frac{2}{5} \\ 0 & 1 & \frac{3}{10} & \frac{7}{10} & -\frac{1}{5} \\ 0 & 0 & \frac{29}{5} & \frac{116}{5} & \frac{29}{5} \\ 0 & 6 & 1 & 1 & -2 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line2}\times(6)} \begin{pmatrix} 1 & 0 & -\frac{11}{10} & -\frac{39}{10} & \frac{2}{5} \\ 0 & 1 & \frac{3}{10} & \frac{7}{10} & -\frac{1}{5} \\ 0 & 0 & \frac{29}{5} & \frac{116}{5} & \frac{29}{5} \\ 0 & 0 & -\frac{4}{5} & -\frac{16}{5} & -\frac{4}{5} \end{pmatrix} \xrightarrow{\text{line3} \times= \left(\frac{5}{29}\right)} \begin{pmatrix} 1 & 0 & -\frac{11}{10} & -\frac{39}{10} & \frac{2}{5} \\ 0 & 1 & \frac{3}{10} & \frac{7}{10} & -\frac{1}{5} \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & -\frac{4}{5} & -\frac{16}{5} & -\frac{4}{5} \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{+}= \text{line3}\times\left(\frac{11}{10}\right)} \begin{pmatrix} 1 & 0 & 0 & \frac{1}{2} & \frac{3}{2} \\ 0 & 1 & \frac{3}{10} & \frac{7}{10} & -\frac{1}{5} \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & -\frac{4}{5} & -\frac{16}{5} & -\frac{4}{5} \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line3}\times\left(\frac{3}{10}\right)} \begin{pmatrix} 1 & 0 & 0 & \frac{1}{2} & \frac{3}{2} \\ 0 & 1 & 0 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & -\frac{4}{5} & -\frac{16}{5} & -\frac{4}{5} \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line3}\times\left(\frac{4}{5}\right)} \begin{pmatrix} 1 & 0 & 0 & \frac{1}{2} & \frac{3}{2} \\ 0 & 1 & 0 & -\frac{1}{2} & -\frac{1}{2} \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -6 & -3 & -8 & -1 & 2 \\ 3 & 0 & 5 & 1 & 0 \\ -2 & -2 & -2 & 0 & 2 \\ 0 & -6 & 4 & 2 & 5 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} -2 & -2 & -2 & 0 & 2 \\ 3 & 0 & 5 & 1 & 0 \\ -6 & -3 & -8 & -1 & 2 \\ 0 & -6 & 4 & 2 & 5 \end{pmatrix} \xrightarrow{\text{line1} \times= \left(-\frac{1}{2}\right)} \begin{pmatrix} 1 & 1 & 1 & 0 & -1 \\ 3 & 0 & 5 & 1 & 0 \\ -6 & -3 & -8 & -1 & 2 \\ 0 & -6 & 4 & 2 & 5 \end{pmatrix}$$

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

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line3}} \begin{pmatrix} 1 & 1 & 1 & 0 & -1 \\ 0 & 0 & 0 & 0 & -1 \\ 0 & 3 & -2 & -1 & -4 \\ 0 & -6 & 4 & 2 & 5 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 1 & 1 & 0 & -1 \\ 0 & 3 & -2 & -1 & -4 \\ 0 & 0 & 0 & 0 & -1 \\ 0 & -6 & 4 & 2 & 5 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \times= \left(\frac{1}{3}\right)} \begin{pmatrix} 1 & 1 & 1 & 0 & -1 \\ 0 & 1 & -\frac{2}{3} & -\frac{1}{3} & -\frac{4}{3} \\ 0 & 0 & 0 & 0 & -1 \\ 0 & -6 & 4 & 2 & 5 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line2}} \begin{pmatrix} 1 & 0 & \frac{5}{3} & \frac{1}{3} & \frac{1}{3} \\ 0 & 1 & -\frac{2}{3} & -\frac{1}{3} & -\frac{4}{3} \\ 0 & 0 & 0 & 0 & -1 \\ 0 & -6 & 4 & 2 & 5 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line2}\times(6)} \begin{pmatrix} 1 & 0 & \frac{5}{3} & \frac{1}{3} & \frac{1}{3} \\ 0 & 1 & -\frac{2}{3} & -\frac{1}{3} & -\frac{4}{3} \\ 0 & 0 & 0 & 0 & -1 \\ 0 & 0 & 0 & 0 & -3 \end{pmatrix} \xrightarrow{\text{line3} \times= (-1)} \begin{pmatrix} 1 & 0 & \frac{5}{3} & \frac{1}{3} & \frac{1}{3} \\ 0 & 1 & -\frac{2}{3} & -\frac{1}{3} & -\frac{4}{3} \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line3}\times\left(\frac{1}{3}\right)} \begin{pmatrix} 1 & 0 & \frac{5}{3} & \frac{1}{3} & 0 \\ 0 & 1 & -\frac{2}{3} & -\frac{1}{3} & -\frac{4}{3} \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -3 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{+}= \text{line3}\times\left(\frac{4}{3}\right)} \begin{pmatrix} 1 & 0 & \frac{5}{3} & \frac{1}{3} & 0 \\ 0 & 1 & -\frac{2}{3} & -\frac{1}{3} & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line3}\times(3)} \begin{pmatrix} 1 & 0 & \frac{5}{3} & \frac{1}{3} & 0 \\ 0 & 1 & -\frac{2}{3} & -\frac{1}{3} & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} -3 & 2 & -1 & 0 & -9 \\ -1 & 0 & 0 & 1 & -1 \\ 2 & 1 & 0 & -3 & 0 \\ -1 & -2 & 3 & 6 & 9 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line4}} \begin{pmatrix} -1 & -2 & 3 & 6 & 9 \\ -1 & 0 & 0 & 1 & -1 \\ 2 & 1 & 0 & -3 & 0 \\ -3 & 2 & -1 & 0 & -9 \end{pmatrix} \xrightarrow{\text{line1} \times= (-1)} \begin{pmatrix} 1 & 2 & -3 & -6 & -9 \\ -1 & 0 & 0 & 1 & -1 \\ 2 & 1 & 0 & -3 & 0 \\ -3 & 2 & -1 & 0 & -9 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & 2 & -3 & -6 & -9 \\ 0 & 2 & -3 & -5 & -10 \\ 2 & 1 & 0 & -3 & 0 \\ -3 & 2 & -1 & 0 & -9 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line1} \times (2)} \begin{pmatrix} 1 & 2 & -3 & -6 & -9 \\ 0 & 2 & -3 & -5 & -10 \\ 0 & -3 & 6 & 9 & 18 \\ -3 & 2 & -1 & 0 & -9 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line1} \times (3)} \begin{pmatrix} 1 & 2 & -3 & -6 & -9 \\ 0 & 2 & -3 & -5 & -10 \\ 0 & -3 & 6 & 9 & 18 \\ 0 & 8 & -10 & -18 & -36 \end{pmatrix}$$

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$$\xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 2 & -3 & -6 & -9 \\ 0 & -3 & 6 & 9 & 18 \\ 0 & 2 & -3 & -5 & -10 \\ 0 & 8 & -10 & -18 & -36 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(-\frac{1}{3}\right)} \begin{pmatrix} 1 & 2 & -3 & -6 & -9 \\ 0 & 1 & -2 & -3 & -6 \\ 0 & 2 & -3 & -5 & -10 \\ 0 & 8 & -10 & -18 & -36 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 1 & 0 & 3 \\ 0 & 1 & -2 & -3 & -6 \\ 0 & 2 & -3 & -5 & -10 \\ 0 & 8 & -10 & -18 & -36 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 1 & 0 & 3 \\ 0 & 1 & -2 & -3 & -6 \\ 0 & 0 & 1 & 1 & 2 \\ 0 & 8 & -10 & -18 & -36 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line2} \times (8)} \begin{pmatrix} 1 & 0 & 1 & 0 & 3 \\ 0 & 1 & -2 & -3 & -6 \\ 0 & 0 & 1 & 1 & 2 \\ 0 & 0 & 6 & 6 & 12 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & -1 & 1 \\ 0 & 1 & -2 & -3 & -6 \\ 0 & 0 & 1 & 1 & 2 \\ 0 & 0 & 6 & 6 & 12 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line3} \times (2)} \begin{pmatrix} 1 & 0 & 0 & -1 & 1 \\ 0 & 1 & 0 & -1 & -2 \\ 0 & 0 & 1 & 1 & 2 \\ 0 & 0 & 6 & 6 & 12 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{-}= \text{line3} \times (6)} \begin{pmatrix} 1 & 0 & 0 & -1 & 1 \\ 0 & 1 & 0 & -1 & -2 \\ 0 & 0 & 1 & 1 & 2 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 1 & -2 & 8 & 1 & -1 \\ 0 & 0 & 0 & 8 & 1 \\ -1 & 1 & -5 & 3 & 2 \\ -2 & 1 & -7 & 6 & 5 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line1}} \begin{pmatrix} 1 & -2 & 8 & 1 & -1 \\ 0 & 0 & 0 & 8 & 1 \\ 0 & -1 & 3 & 4 & 1 \\ -2 & 1 & -7 & 6 & 5 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line1} \times (2)} \begin{pmatrix} 1 & -2 & 8 & 1 & -1 \\ 0 & 0 & 0 & 8 & 1 \\ 0 & -1 & 3 & 4 & 1 \\ 0 & -3 & 9 & 8 & 3 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -2 & 8 & 1 & -1 \\ 0 & -1 & 3 & 4 & 1 \\ 0 & 0 & 0 & 8 & 1 \\ 0 & -3 & 9 & 8 & 3 \end{pmatrix} \xrightarrow{\text{line2} \times= (-1)} \begin{pmatrix} 1 & -2 & 8 & 1 & -1 \\ 0 & 1 & -3 & -4 & -1 \\ 0 & 0 & 0 & 8 & 1 \\ 0 & -3 & 9 & 8 & 3 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{+}= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 2 & -7 & -3 \\ 0 & 1 & -3 & -4 & -1 \\ 0 & 0 & 0 & 8 & 1 \\ 0 & -3 & 9 & 8 & 3 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2} \times (3)} \begin{pmatrix} 1 & 0 & 2 & -7 & -3 \\ 0 & 1 & -3 & -4 & -1 \\ 0 & 0 & 0 & 8 & 1 \\ 0 & 0 & 0 & -4 & 0 \end{pmatrix}$$

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$$\xrightarrow{\text{line3} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 0 & 2 & -7 & -3 \\ 0 & 1 & -3 & -4 & -1 \\ 0 & 0 & 0 & -4 & 0 \\ 0 & 0 & 0 & 8 & 1 \end{pmatrix} \xrightarrow{\text{line3} \times= \left(-\frac{1}{4}\right)} \begin{pmatrix} 1 & 0 & 2 & -7 & -3 \\ 0 & 1 & -3 & -4 & -1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 8 & 1 \end{pmatrix}$$

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

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line3} \times (8)} \begin{pmatrix} 1 & 0 & 2 & 0 & -3 \\ 0 & 1 & -3 & 0 & -1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line4} \times (3)} \begin{pmatrix} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & -3 & 0 & -1 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line4}} \begin{pmatrix} 1 & 0 & 2 & 0 & 0 \\ 0 & 1 & -3 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{pmatrix} 2 & 2 & -2 & -8 & -9 \\ -5 & -5 & 5 & -1 & 1 \\ 5 & 5 & -5 & -4 & -9 \\ -2 & -2 & 2 & 1 & 4 \end{pmatrix} \xrightarrow{\text{line1 += line4}} \begin{pmatrix} 0 & 0 & 0 & -7 & -5 \\ -5 & -5 & 5 & -1 & 1 \\ 5 & 5 & -5 & -4 & -9 \\ -2 & -2 & 2 & 1 & 4 \end{pmatrix} \xrightarrow{\text{line2 += line3}} \begin{pmatrix} 0 & 0 & 0 & -7 & -5 \\ 0 & 0 & 0 & -5 & -8 \\ 5 & 5 & -5 & -4 & -9 \\ -2 & -2 & 2 & 1 & 4 \end{pmatrix}$$
$$\xrightarrow{\text{line3 += line4}\times(2)} \begin{pmatrix} 0 & 0 & 0 & -7 & -5 \\ 0 & 0 & 0 & -5 & -8 \\ 1 & 1 & -1 & -2 & -1 \\ -2 & -2 & 2 & 1 & 4 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 1 & -1 & -2 & -1 \\ 0 & 0 & 0 & -5 & -8 \\ 0 & 0 & 0 & -7 & -5 \\ -2 & -2 & 2 & 1 & 4 \end{pmatrix}$$
$$\xrightarrow{\text{line4 += line1}\times(2)} \begin{pmatrix} 1 & 1 & -1 & -2 & -1 \\ 0 & 0 & 0 & -5 & -8 \\ 0 & 0 & 0 & -7 & -5 \\ 0 & 0 & 0 & -3 & 2 \end{pmatrix} \xrightarrow{\text{line2 -= line4}\times(2)} \begin{pmatrix} 1 & 1 & -1 & -2 & -1 \\ 0 & 0 & 0 & 1 & -12 \\ 0 & 0 & 0 & -7 & -5 \\ 0 & 0 & 0 & -3 & 2 \end{pmatrix}$$
$$\xrightarrow{\text{line1 += line2}\times(2)} \begin{pmatrix} 1 & 1 & -1 & 0 & -25 \\ 0 & 0 & 0 & 1 & -12 \\ 0 & 0 & 0 & -7 & -5 \\ 0 & 0 & 0 & -3 & 2 \end{pmatrix} \xrightarrow{\text{line3 += line2}\times(7)} \begin{pmatrix} 1 & 1 & -1 & 0 & -25 \\ 0 & 0 & 0 & 1 & -12 \\ 0 & 0 & 0 & 0 & -89 \\ 0 & 0 & 0 & -3 & 2 \end{pmatrix}$$
$$\xrightarrow{\text{line4 += line2}\times(3)} \begin{pmatrix} 1 & 1 & -1 & 0 & -25 \\ 0 & 0 & 0 & 1 & -12 \\ 0 & 0 & 0 & 0 & -89 \\ 0 & 0 & 0 & 0 & -34 \end{pmatrix} \xrightarrow{\text{line3 } \times= \left(-\frac{1}{89}\right)} \begin{pmatrix} 1 & 1 & -1 & 0 & -25 \\ 0 & 0 & 0 & 1 & -12 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -34 \end{pmatrix}$$
$$\xrightarrow{\text{line1 += line3}\times(25)} \begin{pmatrix} 1 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 1 & -12 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -34 \end{pmatrix} \xrightarrow{\text{line2 += line3}\times(12)} \begin{pmatrix} 1 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -34 \end{pmatrix}$$
$$\xrightarrow{\text{line4 += line3}\times(34)} \begin{pmatrix} 1 & 1 & -1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 2 & 9 & 2 & 8 & 9 \\ 0 & 1 & 0 & 0 & 1 \\ -1 & -3 & -4 & -9 & 1 \\ 2 & 5 & 1 & 6 & 6 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} -1 & -3 & -4 & -9 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 2 & 9 & 2 & 8 & 9 \\ 2 & 5 & 1 & 6 & 6 \end{pmatrix} \xrightarrow{\text{line1 } \times= (-1)} \begin{pmatrix} 1 & 3 & 4 & 9 & -1 \\ 0 & 1 & 0 & 0 & 1 \\ 2 & 9 & 2 & 8 & 9 \\ 2 & 5 & 1 & 6 & 6 \end{pmatrix}$$
$$\xrightarrow{\text{line3 -= line1}\times(2)} \begin{pmatrix} 1 & 3 & 4 & 9 & -1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 3 & -6 & -10 & 11 \\ 2 & 5 & 1 & 6 & 6 \end{pmatrix} \xrightarrow{\text{line4 -= line1}\times(2)} \begin{pmatrix} 1 & 3 & 4 & 9 & -1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 3 & -6 & -10 & 11 \\ 0 & -1 & -7 & -12 & 8 \end{pmatrix}$$
$$\xrightarrow{\text{line1 -= line2}\times(3)} \begin{pmatrix} 1 & 0 & 4 & 9 & -4 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 3 & -6 & -10 & 11 \\ 0 & -1 & -7 & -12 & 8 \end{pmatrix} \xrightarrow{\text{line3 -= line2}\times(3)} \begin{pmatrix} 1 & 0 & 4 & 9 & -4 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & -6 & -10 & 8 \\ 0 & -1 & -7 & -12 & 8 \end{pmatrix}$$
$$\xrightarrow{\text{line4 += line2}} \begin{pmatrix} 1 & 0 & 4 & 9 & -4 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & -6 & -10 & 8 \\ 0 & 0 & -7 & -12 & 9 \end{pmatrix} \xrightarrow{\text{line3 -= line4}} \begin{pmatrix} 1 & 0 & 4 & 9 & -4 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 2 & -1 \\ 0 & 0 & -7 & -12 & 9 \end{pmatrix}$$
$$\xrightarrow{\text{line1 -= line3}\times(4)} \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 2 & -1 \\ 0 & 0 & -7 & -12 & 9 \end{pmatrix} \xrightarrow{\text{line4 += line3}\times(7)} \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 2 & -1 \\ 0 & 0 & 0 & 2 & 2 \end{pmatrix}$$
$$\xrightarrow{\text{line4 } \times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 2 & -1 \\ 0 & 0 & 0 & 1 & 1 \end{pmatrix} \xrightarrow{\text{line1 -= line4}} \begin{pmatrix} 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 2 & -1 \\ 0 & 0 & 0 & 1 & 1 \end{pmatrix}$$
$$\xrightarrow{\text{line3 -= line4}\times(2)} \begin{pmatrix} 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 0 & -3 \\ 0 & 0 & 0 & 1 & 1 \end{pmatrix}$$

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$$\begin{pmatrix} 3 & 2 & -4 & -6 & -2 \\ 1 & 3 & 1 & -9 & -1 \\ -3 & -1 & 5 & 3 & -9 \\ 1 & 0 & -2 & 0 & 5 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & 3 & 1 & -9 & -1 \\ 3 & 2 & -4 & -6 & -2 \\ -3 & -1 & 5 & 3 & -9 \\ 1 & 0 & -2 & 0 & 5 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line1}\times(3)} \begin{pmatrix} 1 & 3 & 1 & -9 & -1 \\ 0 & -7 & -7 & 21 & 1 \\ -3 & -1 & 5 & 3 & -9 \\ 1 & 0 & -2 & 0 & 5 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{+}= \text{line1}\times(3)} \begin{pmatrix} 1 & 3 & 1 & -9 & -1 \\ 0 & -7 & -7 & 21 & 1 \\ 0 & 8 & 8 & -24 & -12 \\ 1 & 0 & -2 & 0 & 5 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{-}= \text{line1}} \begin{pmatrix} 1 & 3 & 1 & -9 & -1 \\ 0 & -7 & -7 & 21 & 1 \\ 0 & 8 & 8 & -24 & -12 \\ 0 & -3 & -3 & 9 & 6 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 3 & 1 & -9 & -1 \\ 0 & -3 & -3 & 9 & 6 \\ 0 & 8 & 8 & -24 & -12 \\ 0 & -7 & -7 & 21 & 1 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(-\frac{1}{3}\right)} \begin{pmatrix} 1 & 3 & 1 & -9 & -1 \\ 0 & 1 & 1 & -3 & -2 \\ 0 & 8 & 8 & -24 & -12 \\ 0 & -7 & -7 & 21 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line2}\times(3)} \begin{pmatrix} 1 & 0 & -2 & 0 & 5 \\ 0 & 1 & 1 & -3 & -2 \\ 0 & 8 & 8 & -24 & -12 \\ 0 & -7 & -7 & 21 & 1 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line2}\times(8)} \begin{pmatrix} 1 & 0 & -2 & 0 & 5 \\ 0 & 1 & 1 & -3 & -2 \\ 0 & 0 & 0 & 0 & 4 \\ 0 & -7 & -7 & 21 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line2}\times(7)} \begin{pmatrix} 1 & 0 & -2 & 0 & 5 \\ 0 & 1 & 1 & -3 & -2 \\ 0 & 0 & 0 & 0 & 4 \\ 0 & 0 & 0 & 0 & -13 \end{pmatrix} \xrightarrow{\text{line3} \times= \left(\frac{1}{4}\right)} \begin{pmatrix} 1 & 0 & -2 & 0 & 5 \\ 0 & 1 & 1 & -3 & -2 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -13 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line3}\times(5)} \begin{pmatrix} 1 & 0 & -2 & 0 & 0 \\ 0 & 1 & 1 & -3 & -2 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -13 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{+}= \text{line3}\times(2)} \begin{pmatrix} 1 & 0 & -2 & 0 & 0 \\ 0 & 1 & 1 & -3 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & -13 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line3}\times(13)} \begin{pmatrix} 1 & 0 & -2 & 0 & 0 \\ 0 & 1 & 1 & -3 & 0 \\ 0 & 0 & 0 & 0 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

$$\begin{pmatrix} 8 & -7 & -7 & 3 & -8 \\ -1 & 3 & 2 & -5 & -5 \\ -6 & 7 & 6 & -6 & 1 \\ 5 & -3 & -4 & -1 & -9 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} -1 & 3 & 2 & -5 & -5 \\ 8 & -7 & -7 & 3 & -8 \\ -6 & 7 & 6 & -6 & 1 \\ 5 & -3 & -4 & -1 & -9 \end{pmatrix} \xrightarrow{\text{line1} \times= (-1)} \begin{pmatrix} 1 & -3 & -2 & 5 & 5 \\ 8 & -7 & -7 & 3 & -8 \\ -6 & 7 & 6 & -6 & 1 \\ 5 & -3 & -4 & -1 & -9 \end{pmatrix}$$

$$\xrightarrow{\text{line2} -= \text{line1} \times (8)} \begin{pmatrix} 1 & -3 & -2 & 5 & 5 \\ 0 & 17 & 9 & -37 & -48 \\ -6 & 7 & 6 & -6 & 1 \\ 5 & -3 & -4 & -1 & -9 \end{pmatrix}$$

$$\xrightarrow{\text{line3} += \text{line1} \times (6)} \begin{pmatrix} 1 & -3 & -2 & 5 & 5 \\ 0 & 17 & 9 & -37 & -48 \\ 0 & -11 & -6 & 24 & 31 \\ 5 & -3 & -4 & -1 & -9 \end{pmatrix}$$

$$\xrightarrow{\text{line4} -= \text{line1} \times (5)} \begin{pmatrix} 1 & -3 & -2 & 5 & 5 \\ 0 & 17 & 9 & -37 & -48 \\ 0 & -11 & -6 & 24 & 31 \\ 0 & 12 & 6 & -26 & -34 \end{pmatrix}$$

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$$\xrightarrow{\text{line3} += \text{line4}} \begin{pmatrix} 1 & -3 & -2 & 5 & 5 \\ 0 & 17 & 9 & -37 & -48 \\ 0 & 1 & 0 & -2 & -3 \\ 0 & 12 & 6 & -26 & -34 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -3 & -2 & 5 & 5 \\ 0 & 1 & 0 & -2 & -3 \\ 0 & 17 & 9 & -37 & -48 \\ 0 & 12 & 6 & -26 & -34 \end{pmatrix}$$

$$\xrightarrow{\text{line1} += \text{line2} \times (3)} \begin{pmatrix} 1 & 0 & -2 & -1 & -4 \\ 0 & 1 & 0 & -2 & -3 \\ 0 & 17 & 9 & -37 & -48 \\ 0 & 12 & 6 & -26 & -34 \end{pmatrix}$$

$$\xrightarrow{\text{line3} -= \text{line2} \times (17)} \begin{pmatrix} 1 & 0 & -2 & -1 & -4 \\ 0 & 1 & 0 & -2 & -3 \\ 0 & 0 & 9 & -3 & 3 \\ 0 & 12 & 6 & -26 & -34 \end{pmatrix} \xrightarrow{\text{line4} -= \text{line2} \times (12)} \begin{pmatrix} 1 & 0 & -2 & -1 & -4 \\ 0 & 1 & 0 & -2 & -3 \\ 0 & 0 & 9 & -3 & 3 \\ 0 & 0 & 6 & -2 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \times= \left(\frac{1}{9}\right)} \begin{pmatrix} 1 & 0 & -2 & -1 & -4 \\ 0 & 1 & 0 & -2 & -3 \\ 0 & 0 & 1 & -\frac{1}{3} & \frac{1}{3} \\ 0 & 0 & 6 & -2 & 2 \end{pmatrix} \xrightarrow{\text{line1} += \text{line3} \times (2)} \begin{pmatrix} 1 & 0 & 0 & -\frac{5}{3} & -\frac{10}{3} \\ 0 & 1 & 0 & -2 & -3 \\ 0 & 0 & 1 & -\frac{1}{3} & \frac{1}{3} \\ 0 & 0 & 6 & -2 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line4} -= \text{line3} \times (6)} \begin{pmatrix} 1 & 0 & 0 & -\frac{5}{3} & -\frac{10}{3} \\ 0 & 1 & 0 & -2 & -3 \\ 0 & 0 & 1 & -\frac{1}{3} & \frac{1}{3} \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 8 & -3 & 5 & -9 & -3 \\ -4 & 3 & 0 & 9 & 5 \\ -6 & 3 & -2 & 9 & 5 \\ -1 & -2 & -1 & -6 & 2 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line4}} \begin{pmatrix} -1 & -2 & -1 & -6 & 2 \\ -4 & 3 & 0 & 9 & 5 \\ -6 & 3 & -2 & 9 & 5 \\ 8 & -3 & 5 & -9 & -3 \end{pmatrix} \xrightarrow{\text{line1} \times= (-1)} \begin{pmatrix} 1 & 2 & 1 & 6 & -2 \\ -4 & 3 & 0 & 9 & 5 \\ -6 & 3 & -2 & 9 & 5 \\ 8 & -3 & 5 & -9 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line1}\times(4)} \begin{pmatrix} 1 & 2 & 1 & 6 & -2 \\ 0 & 11 & 4 & 33 & -3 \\ -6 & 3 & -2 & 9 & 5 \\ 8 & -3 & 5 & -9 & -3 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{+}= \text{line1}\times(6)} \begin{pmatrix} 1 & 2 & 1 & 6 & -2 \\ 0 & 11 & 4 & 33 & -3 \\ 0 & 15 & 4 & 45 & -7 \\ 8 & -3 & 5 & -9 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line1}\times(8)} \begin{pmatrix} 1 & 2 & 1 & 6 & -2 \\ 0 & 11 & 4 & 33 & -3 \\ 0 & 15 & 4 & 45 & -7 \\ 0 & -19 & -3 & -57 & 13 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(\frac{1}{11}\right)} \begin{pmatrix} 1 & 2 & 1 & 6 & -2 \\ 0 & 1 & \frac{4}{11} & 3 & -\frac{3}{11} \\ 0 & 15 & 4 & 45 & -7 \\ 0 & -19 & -3 & -57 & 13 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line2}\times(2)} \begin{pmatrix} 1 & 0 & \frac{3}{11} & 0 & -\frac{16}{11} \\ 0 & 1 & \frac{4}{11} & 3 & -\frac{3}{11} \\ 0 & 15 & 4 & 45 & -7 \\ 0 & -19 & -3 & -57 & 13 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{-}= \text{line2}\times(15)} \begin{pmatrix} 1 & 0 & \frac{3}{11} & 0 & -\frac{16}{11} \\ 0 & 1 & \frac{4}{11} & 3 & -\frac{3}{11} \\ 0 & 0 & -\frac{16}{11} & 0 & -\frac{32}{11} \\ 0 & -19 & -3 & -57 & 13 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line2}\times(19)} \begin{pmatrix} 1 & 0 & \frac{3}{11} & 0 & -\frac{16}{11} \\ 0 & 1 & \frac{4}{11} & 3 & -\frac{3}{11} \\ 0 & 0 & -\frac{16}{11} & 0 & -\frac{32}{11} \\ 0 & 0 & \frac{43}{11} & 0 & \frac{86}{11} \end{pmatrix} \xrightarrow{\text{line3} \times= \left(-\frac{11}{16}\right)} \begin{pmatrix} 1 & 0 & \frac{3}{11} & 0 & -\frac{16}{11} \\ 0 & 1 & \frac{4}{11} & 3 & -\frac{3}{11} \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & \frac{43}{11} & 0 & \frac{86}{11} \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line3}\times\left(\frac{3}{11}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & -2 \\ 0 & 1 & \frac{4}{11} & 3 & -\frac{3}{11} \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & \frac{43}{11} & 0 & \frac{86}{11} \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line3}\times\left(\frac{4}{11}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & -2 \\ 0 & 1 & 0 & 3 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & \frac{43}{11} & 0 & \frac{86}{11} \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line3}\times\left(\frac{43}{11}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & -2 \\ 0 & 1 & 0 & 3 & -1 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -2 & -5 & 4 & -3 & 1 \\ -3 & -5 & 1 & -9 & 3 \\ -2 & 0 & -6 & -1 & -1 \\ -2 & -7 & 8 & -2 & 1 \end{pmatrix} \xrightarrow{\text{line1 } -= \text{ line2}} \begin{pmatrix} 1 & 0 & 3 & 6 & -2 \\ -3 & -5 & 1 & -9 & 3 \\ -2 & 0 & -6 & -1 & -1 \\ -2 & -7 & 8 & -2 & 1 \end{pmatrix} \xrightarrow{\text{line2 } += \text{ line1}\times(3)} \begin{pmatrix} 1 & 0 & 3 & 6 & -2 \\ 0 & -5 & 10 & 9 & -3 \\ -2 & 0 & -6 & -1 & -1 \\ -2 & -7 & 8 & -2 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } += \text{ line1}\times(2)} \begin{pmatrix} 1 & 0 & 3 & 6 & -2 \\ 0 & -5 & 10 & 9 & -3 \\ 0 & 0 & 0 & 11 & -5 \\ -2 & -7 & 8 & -2 & 1 \end{pmatrix} \xrightarrow{\text{line4 } += \text{ line1}\times(2)} \begin{pmatrix} 1 & 0 & 3 & 6 & -2 \\ 0 & -5 & 10 & 9 & -3 \\ 0 & 0 & 0 & 11 & -5 \\ 0 & -7 & 14 & 10 & -3 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } \times= \left(-\frac{1}{5}\right)} \begin{pmatrix} 1 & 0 & 3 & 6 & -2 \\ 0 & 1 & -2 & -\frac{9}{5} & \frac{3}{5} \\ 0 & 0 & 0 & 11 & -5 \\ 0 & -7 & 14 & 10 & -3 \end{pmatrix} \xrightarrow{\text{line4 } += \text{ line2}\times(7)} \begin{pmatrix} 1 & 0 & 3 & 6 & -2 \\ 0 & 1 & -2 & -\frac{9}{5} & \frac{3}{5} \\ 0 & 0 & 0 & 11 & -5 \\ 0 & 0 & 0 & -\frac{13}{5} & \frac{6}{5} \end{pmatrix}$$

$$\xrightarrow{\text{line3 } \times= \left(\frac{1}{11}\right)} \begin{pmatrix} 1 & 0 & 3 & 6 & -2 \\ 0 & 1 & -2 & -\frac{9}{5} & \frac{3}{5} \\ 0 & 0 & 0 & 1 & -\frac{5}{11} \\ 0 & 0 & 0 & -\frac{13}{5} & \frac{6}{5} \end{pmatrix} \xrightarrow{\text{line1 } -= \text{ line3}\times(6)} \begin{pmatrix} 1 & 0 & 3 & 0 & \frac{8}{11} \\ 0 & 1 & -2 & -\frac{9}{5} & \frac{3}{5} \\ 0 & 0 & 0 & 1 & -\frac{5}{11} \\ 0 & 0 & 0 & -\frac{13}{5} & \frac{6}{5} \end{pmatrix}$$

$$\xrightarrow{\text{line2 } += \text{ line3}\times\left(\frac{9}{5}\right)} \begin{pmatrix} 1 & 0 & 3 & 0 & \frac{8}{11} \\ 0 & 1 & -2 & 0 & -\frac{12}{55} \\ 0 & 0 & 0 & 1 & -\frac{5}{11} \\ 0 & 0 & 0 & -\frac{13}{5} & \frac{6}{5} \end{pmatrix} \xrightarrow{\text{line4 } += \text{ line3}\times\left(\frac{13}{5}\right)} \begin{pmatrix} 1 & 0 & 3 & 0 & \frac{8}{11} \\ 0 & 1 & -2 & 0 & -\frac{12}{55} \\ 0 & 0 & 0 & 1 & -\frac{5}{11} \\ 0 & 0 & 0 & 0 & \frac{1}{55} \end{pmatrix}$$

$$\xrightarrow{\text{line4 } \times= (55)} \begin{pmatrix} 1 & 0 & 3 & 0 & \frac{8}{11} \\ 0 & 1 & -2 & 0 & -\frac{12}{55} \\ 0 & 0 & 0 & 1 & -\frac{5}{11} \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line1 } -= \text{ line4}\times\left(\frac{8}{11}\right)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & -2 & 0 & -\frac{12}{55} \\ 0 & 0 & 0 & 1 & -\frac{5}{11} \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } += \text{ line4}\times\left(\frac{12}{55}\right)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & -2 & 0 & 0 \\ 0 & 0 & 0 & 1 & -\frac{5}{11} \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line3 } += \text{ line4}\times\left(\frac{5}{11}\right)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & -2 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{pmatrix} -2 & 1 & 0 & 4 & 6 \\ -3 & -5 & 3 & -7 & 9 \\ -1 & 4 & -5 & 9 & 3 \\ -2 & 1 & -2 & 4 & 6 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} -1 & 4 & -5 & 9 & 3 \\ -3 & -5 & 3 & -7 & 9 \\ -2 & 1 & 0 & 4 & 6 \\ -2 & 1 & -2 & 4 & 6 \end{pmatrix} \xrightarrow{\text{line1} \times= (-1)} \begin{pmatrix} 1 & -4 & 5 & -9 & -3 \\ -3 & -5 & 3 & -7 & 9 \\ -2 & 1 & 0 & 4 & 6 \\ -2 & 1 & -2 & 4 & 6 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line1} \times (3)} \begin{pmatrix} 1 & -4 & 5 & -9 & -3 \\ 0 & -17 & 18 & -34 & 0 \\ -2 & 1 & 0 & 4 & 6 \\ -2 & 1 & -2 & 4 & 6 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{+}= \text{line1} \times (2)} \begin{pmatrix} 1 & -4 & 5 & -9 & -3 \\ 0 & -17 & 18 & -34 & 0 \\ 0 & -7 & 10 & -14 & 0 \\ -2 & 1 & -2 & 4 & 6 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{+}= \text{line1} \times (2)} \begin{pmatrix} 1 & -4 & 5 & -9 & -3 \\ 0 & -17 & 18 & -34 & 0 \\ 0 & -7 & 10 & -14 & 0 \\ 0 & -7 & 8 & -14 & 0 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line4}} \begin{pmatrix} 1 & -4 & 5 & -9 & -3 \\ 0 & -17 & 18 & -34 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & -7 & 8 & -14 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & -4 & 5 & -9 & -3 \\ 0 & -7 & 8 & -14 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & -17 & 18 & -34 & 0 \end{pmatrix} \xrightarrow{\text{line2} \times= \left(-\frac{1}{7}\right)} \begin{pmatrix} 1 & -4 & 5 & -9 & -3 \\ 0 & 1 & -\frac{8}{7} & 2 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & -17 & 18 & -34 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{+}= \text{line2} \times (4)} \begin{pmatrix} 1 & 0 & \frac{3}{7} & -1 & -3 \\ 0 & 1 & -\frac{8}{7} & 2 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & -17 & 18 & -34 & 0 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2} \times (17)} \begin{pmatrix} 1 & 0 & \frac{3}{7} & -1 & -3 \\ 0 & 1 & -\frac{8}{7} & 2 & 0 \\ 0 & 0 & 2 & 0 & 0 \\ 0 & 0 & -\frac{10}{7} & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & \frac{3}{7} & -1 & -3 \\ 0 & 1 & -\frac{8}{7} & 2 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & -\frac{10}{7} & 0 & 0 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line3} \times \left(\frac{3}{7}\right)} \begin{pmatrix} 1 & 0 & 0 & -1 & -3 \\ 0 & 1 & -\frac{8}{7} & 2 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & -\frac{10}{7} & 0 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line3} \times \left(\frac{8}{7}\right)} \begin{pmatrix} 1 & 0 & 0 & -1 & -3 \\ 0 & 1 & 0 & 2 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & -\frac{10}{7} & 0 & 0 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line3} \times \left(\frac{10}{7}\right)} \begin{pmatrix} 1 & 0 & 0 & -1 & -3 \\ 0 & 1 & 0 & 2 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -2 & 1 & 4 & 2 & -2 \\ 0 & 1 & 2 & 0 & 5 \\ -1 & 1 & 1 & -1 & -9 \\ 0 & -1 & 0 & 2 & 5 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} -1 & 1 & 1 & -1 & -9 \\ 0 & 1 & 2 & 0 & 5 \\ -2 & 1 & 4 & 2 & -2 \\ 0 & -1 & 0 & 2 & 5 \end{pmatrix} \xrightarrow{\text{line1} \times= (-1)} \begin{pmatrix} 1 & -1 & -1 & 1 & 9 \\ 0 & 1 & 2 & 0 & 5 \\ -2 & 1 & 4 & 2 & -2 \\ 0 & -1 & 0 & 2 & 5 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{+}= \text{line1} \times (2)} \begin{pmatrix} 1 & -1 & -1 & 1 & 9 \\ 0 & 1 & 2 & 0 & 5 \\ 0 & -1 & 2 & 4 & 16 \\ 0 & -1 & 0 & 2 & 5 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{+}= \text{line2}} \begin{pmatrix} 1 & 0 & 1 & 1 & 14 \\ 0 & 1 & 2 & 0 & 5 \\ 0 & -1 & 2 & 4 & 16 \\ 0 & -1 & 0 & 2 & 5 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \mathrel{+}= \text{line2}} \begin{pmatrix} 1 & 0 & 1 & 1 & 14 \\ 0 & 1 & 2 & 0 & 5 \\ 0 & 0 & 4 & 4 & 21 \\ 0 & -1 & 0 & 2 & 5 \end{pmatrix} \xrightarrow{\text{line4} \mathrel{+}= \text{line2}} \begin{pmatrix} 1 & 0 & 1 & 1 & 14 \\ 0 & 1 & 2 & 0 & 5 \\ 0 & 0 & 4 & 4 & 21 \\ 0 & 0 & 2 & 2 & 10 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 0 & 1 & 1 & 14 \\ 0 & 1 & 2 & 0 & 5 \\ 0 & 0 & 2 & 2 & 10 \\ 0 & 0 & 4 & 4 & 21 \end{pmatrix} \xrightarrow{\text{line3} \times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & 1 & 1 & 14 \\ 0 & 1 & 2 & 0 & 5 \\ 0 & 0 & 1 & 1 & 5 \\ 0 & 0 & 4 & 4 & 21 \end{pmatrix}$$

$$\xrightarrow{\text{line1} \mathrel{-}= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & 0 & 9 \\ 0 & 1 & 2 & 0 & 5 \\ 0 & 0 & 1 & 1 & 5 \\ 0 & 0 & 4 & 4 & 21 \end{pmatrix} \xrightarrow{\text{line2} \mathrel{-}= \text{line3} \times (2)} \begin{pmatrix} 1 & 0 & 0 & 0 & 9 \\ 0 & 1 & 0 & -2 & -5 \\ 0 & 0 & 1 & 1 & 5 \\ 0 & 0 & 4 & 4 & 21 \end{pmatrix}$$

$$\xrightarrow{\text{line4} \mathrel{-}= \text{line3} \times (4)} \begin{pmatrix} 1 & 0 & 0 & 0 & 9 \\ 0 & 1 & 0 & -2 & -5 \\ 0 & 0 & 1 & 1 & 5 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line1} \mathrel{-}= \text{line4} \times (9)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -2 & -5 \\ 0 & 0 & 1 & 1 & 5 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \mathrel{+}= \text{line4} \times (5)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -2 & 0 \\ 0 & 0 & 1 & 1 & 5 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line3} \mathrel{-}= \text{line4} \times (5)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & -2 & 0 \\ 0 & 0 & 1 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{pmatrix} -1 & 2 & -3 & 9 & 6 \\ 1 & -2 & 3 & -8 & -6 \\ -2 & 0 & -6 & 7 & -2 \\ 2 & -1 & 6 & -8 & -1 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & -2 & 3 & -8 & -6 \\ -1 & 2 & -3 & 9 & 6 \\ -2 & 0 & -6 & 7 & -2 \\ 2 & -1 & 6 & -8 & -1 \end{pmatrix} \xrightarrow{\text{line2 += line1}} \begin{pmatrix} 1 & -2 & 3 & -8 & -6 \\ 0 & 0 & 0 & 1 & 0 \\ -2 & 0 & -6 & 7 & -2 \\ 2 & -1 & 6 & -8 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line1}\times(2)} \begin{pmatrix} 1 & -2 & 3 & -8 & -6 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & -4 & 0 & -9 & -14 \\ 2 & -1 & 6 & -8 & -1 \end{pmatrix} \xrightarrow{\text{line4 -= line1}\times(2)} \begin{pmatrix} 1 & -2 & 3 & -8 & -6 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & -4 & 0 & -9 & -14 \\ 0 & 3 & 0 & 8 & 11 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line4}} \begin{pmatrix} 1 & -2 & 3 & -8 & -6 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & -1 & 0 & -1 & -3 \\ 0 & 3 & 0 & 8 & 11 \end{pmatrix} \xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -2 & 3 & -8 & -6 \\ 0 & -1 & 0 & -1 & -3 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 3 & 0 & 8 & 11 \end{pmatrix}$$

$$\xrightarrow{\text{line2 }\times= (-1)} \begin{pmatrix} 1 & -2 & 3 & -8 & -6 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 3 & 0 & 8 & 11 \end{pmatrix} \xrightarrow{\text{line1 += line2}\times(2)} \begin{pmatrix} 1 & 0 & 3 & -6 & 0 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 3 & 0 & 8 & 11 \end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line2}\times(3)} \begin{pmatrix} 1 & 0 & 3 & -6 & 0 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 5 & 2 \end{pmatrix} \xrightarrow{\text{line1 += line3}\times(6)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & 0 & 1 & 3 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 5 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line3}} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & 0 & 0 & 3 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 5 & 2 \end{pmatrix} \xrightarrow{\text{line4 -= line3}\times(5)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & 0 & 0 & 3 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line4 }\times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & 0 & 0 & 3 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line2 -= line4}\times(3)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{pmatrix} 1 & 3 & -1 & 4 & -2 \\ -2 & -2 & 2 & -7 & 4 \\ 0 & 5 & 0 & 0 & -1 \\ -1 & -2 & 0 & 1 & 4 \end{pmatrix} \xrightarrow{\text{line2 += line1}\times(2)} \begin{pmatrix} 1 & 3 & -1 & 4 & -2 \\ 0 & 4 & 0 & 1 & 0 \\ 0 & 5 & 0 & 0 & -1 \\ -1 & -2 & 0 & 1 & 4 \end{pmatrix} \xrightarrow{\text{line4 += line1}} \begin{pmatrix} 1 & 3 & -1 & 4 & -2 \\ 0 & 4 & 0 & 1 & 0 \\ 0 & 5 & 0 & 0 & -1 \\ 0 & 1 & -1 & 5 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 3 & -1 & 4 & -2 \\ 0 & 1 & -1 & 5 & 2 \\ 0 & 5 & 0 & 0 & -1 \\ 0 & 4 & 0 & 1 & 0 \end{pmatrix} \xrightarrow{\text{line1 -= line2}\times(3)} \begin{pmatrix} 1 & 0 & 2 & -11 & -8 \\ 0 & 1 & -1 & 5 & 2 \\ 0 & 5 & 0 & 0 & -1 \\ 0 & 4 & 0 & 1 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line2}\times(5)} \begin{pmatrix} 1 & 0 & 2 & -11 & -8 \\ 0 & 1 & -1 & 5 & 2 \\ 0 & 0 & 5 & -25 & -11 \\ 0 & 4 & 0 & 1 & 0 \end{pmatrix} \xrightarrow{\text{line4 -= line2}\times(4)} \begin{pmatrix} 1 & 0 & 2 & -11 & -8 \\ 0 & 1 & -1 & 5 & 2 \\ 0 & 0 & 5 & -25 & -11 \\ 0 & 0 & 4 & -19 & -8 \end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line4}} \begin{pmatrix} 1 & 0 & 2 & -11 & -8 \\ 0 & 1 & -1 & 5 & 2 \\ 0 & 0 & 1 & -6 & -3 \\ 0 & 0 & 4 & -19 & -8 \end{pmatrix} \xrightarrow{\text{line1 -= line3}\times(2)} \begin{pmatrix} 1 & 0 & 0 & 1 & -2 \\ 0 & 1 & -1 & 5 & 2 \\ 0 & 0 & 1 & -6 & -3 \\ 0 & 0 & 4 & -19 & -8 \end{pmatrix}$$

$$\xrightarrow{\text{line2 += line3}} \begin{pmatrix} 1 & 0 & 0 & 1 & -2 \\ 0 & 1 & 0 & -1 & -1 \\ 0 & 0 & 1 & -6 & -3 \\ 0 & 0 & 4 & -19 & -8 \end{pmatrix} \xrightarrow{\text{line4 -= line3}\times(4)} \begin{pmatrix} 1 & 0 & 0 & 1 & -2 \\ 0 & 1 & 0 & -1 & -1 \\ 0 & 0 & 1 & -6 & -3 \\ 0 & 0 & 0 & 5 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line4 }\times= \left(\frac{1}{5}\right)} \begin{pmatrix} 1 & 0 & 0 & 1 & -2 \\ 0 & 1 & 0 & -1 & -1 \\ 0 & 0 & 1 & -6 & -3 \\ 0 & 0 & 0 & 1 & \frac{4}{5} \end{pmatrix} \xrightarrow{\text{line1 -= line4}} \begin{pmatrix} 1 & 0 & 0 & 0 & -\frac{14}{5} \\ 0 & 1 & 0 & -1 & -1 \\ 0 & 0 & 1 & -6 & -3 \\ 0 & 0 & 0 & 1 & \frac{4}{5} \end{pmatrix}$$

$$\xrightarrow{\text{line2 += line4}} \begin{pmatrix} 1 & 0 & 0 & 0 & -\frac{14}{5} \\ 0 & 1 & 0 & 0 & -\frac{1}{5} \\ 0 & 0 & 1 & -6 & -3 \\ 0 & 0 & 0 & 1 & \frac{4}{5} \end{pmatrix} \xrightarrow{\text{line3 += line4}\times(6)} \begin{pmatrix} 1 & 0 & 0 & 0 & -\frac{14}{5} \\ 0 & 1 & 0 & 0 & -\frac{1}{5} \\ 0 & 0 & 1 & 0 & \frac{9}{5} \\ 0 & 0 & 0 & 1 & \frac{4}{5} \end{pmatrix}$$

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$$\begin{pmatrix} 2 & -1 & 8 & 8 & -7 \\ 3 & 1 & 7 & 3 & -1 \\ 1 & -1 & 5 & 6 & -6 \\ 2 & 1 & 4 & 0 & 2 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -1 & 5 & 6 & -6 \\ 3 & 1 & 7 & 3 & -1 \\ 2 & -1 & 8 & 8 & -7 \\ 2 & 1 & 4 & 0 & 2 \end{pmatrix} \xrightarrow{\text{line2 -= line1}\times(3)} \begin{pmatrix} 1 & -1 & 5 & 6 & -6 \\ 0 & 4 & -8 & -15 & 17 \\ 2 & -1 & 8 & 8 & -7 \\ 2 & 1 & 4 & 0 & 2 \end{pmatrix}$$
$$\xrightarrow{\text{line3 -= line1}\times(2)} \begin{pmatrix} 1 & -1 & 5 & 6 & -6 \\ 0 & 4 & -8 & -15 & 17 \\ 0 & 1 & -2 & -4 & 5 \\ 2 & 1 & 4 & 0 & 2 \end{pmatrix} \xrightarrow{\text{line4 -= line1}\times(2)} \begin{pmatrix} 1 & -1 & 5 & 6 & -6 \\ 0 & 4 & -8 & -15 & 17 \\ 0 & 1 & -2 & -4 & 5 \\ 0 & 3 & -6 & -12 & 14 \end{pmatrix}$$
$$\xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & -1 & 5 & 6 & -6 \\ 0 & 1 & -2 & -4 & 5 \\ 0 & 4 & -8 & -15 & 17 \\ 0 & 3 & -6 & -12 & 14 \end{pmatrix} \xrightarrow{\text{line1 += line2}} \begin{pmatrix} 1 & 0 & 3 & 2 & -1 \\ 0 & 1 & -2 & -4 & 5 \\ 0 & 4 & -8 & -15 & 17 \\ 0 & 3 & -6 & -12 & 14 \end{pmatrix}$$
$$\xrightarrow{\text{line3 -= line2}\times(4)} \begin{pmatrix} 1 & 0 & 3 & 2 & -1 \\ 0 & 1 & -2 & -4 & 5 \\ 0 & 0 & 0 & 1 & -3 \\ 0 & 3 & -6 & -12 & 14 \end{pmatrix} \xrightarrow{\text{line4 -= line2}\times(3)} \begin{pmatrix} 1 & 0 & 3 & 2 & -1 \\ 0 & 1 & -2 & -4 & 5 \\ 0 & 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix}$$
$$\xrightarrow{\text{line1 -= line3}\times(2)} \begin{pmatrix} 1 & 0 & 3 & 0 & 5 \\ 0 & 1 & -2 & -4 & 5 \\ 0 & 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix} \xrightarrow{\text{line2 += line3}\times(4)} \begin{pmatrix} 1 & 0 & 3 & 0 & 5 \\ 0 & 1 & -2 & 0 & -7 \\ 0 & 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 0 & -1 \end{pmatrix}$$
$$\xrightarrow{\text{line4 }\times= (-1)} \begin{pmatrix} 1 & 0 & 3 & 0 & 5 \\ 0 & 1 & -2 & 0 & -7 \\ 0 & 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line1 -= line4}\times(5)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & -2 & 0 & -7 \\ 0 & 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$
$$\xrightarrow{\text{line2 += line4}\times(7)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & -2 & 0 & 0 \\ 0 & 0 & 0 & 1 & -3 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line3 += line4}\times(3)} \begin{pmatrix} 1 & 0 & 3 & 0 & 0 \\ 0 & 1 & -2 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} 6 & 5 & 2 & 6 & 5 \\ 8 & 3 & 3 & 9 & 2 \\ -7 & 4 & 1 & 3 & -6 \\ 0 & -3 & -1 & -3 & 0 \end{pmatrix} \xrightarrow{\text{line2 += line3}} \begin{pmatrix} 6 & 5 & 2 & 6 & 5 \\ 1 & 7 & 4 & 12 & -4 \\ -7 & 4 & 1 & 3 & -6 \\ 0 & -3 & -1 & -3 & 0 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line2}} \begin{pmatrix} 1 & 7 & 4 & 12 & -4 \\ 6 & 5 & 2 & 6 & 5 \\ -7 & 4 & 1 & 3 & -6 \\ 0 & -3 & -1 & -3 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line1}\times(6)} \begin{pmatrix} 1 & 7 & 4 & 12 & -4 \\ 0 & -37 & -22 & -66 & 29 \\ -7 & 4 & 1 & 3 & -6 \\ 0 & -3 & -1 & -3 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line1}\times(7)} \begin{pmatrix} 1 & 7 & 4 & 12 & -4 \\ 0 & -37 & -22 & -66 & 29 \\ 0 & 53 & 29 & 87 & -34 \\ 0 & -3 & -1 & -3 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line4}\times(12)} \begin{pmatrix} 1 & 7 & 4 & 12 & -4 \\ 0 & -1 & -10 & -30 & 29 \\ 0 & 53 & 29 & 87 & -34 \\ 0 & -3 & -1 & -3 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } \times= (-1)} \begin{pmatrix} 1 & 7 & 4 & 12 & -4 \\ 0 & 1 & 10 & 30 & -29 \\ 0 & 53 & 29 & 87 & -34 \\ 0 & -3 & -1 & -3 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line1 -= line2}\times(7)} \begin{pmatrix} 1 & 0 & -66 & -198 & 199 \\ 0 & 1 & 10 & 30 & -29 \\ 0 & 53 & 29 & 87 & -34 \\ 0 & -3 & -1 & -3 & 0 \end{pmatrix}$$

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$$\xrightarrow{\text{line3 -= line2}\times(53)} \begin{pmatrix} 1 & 0 & -66 & -198 & 199 \\ 0 & 1 & 10 & 30 & -29 \\ 0 & 0 & -501 & -1503 & 1503 \\ 0 & -3 & -1 & -3 & 0 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2}\times(3)} \begin{pmatrix} 1 & 0 & -66 & -198 & 199 \\ 0 & 1 & 10 & 30 & -29 \\ 0 & 0 & -501 & -1503 & 1503 \\ 0 & 0 & 29 & 87 & -87 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 0 & -66 & -198 & 199 \\ 0 & 1 & 10 & 30 & -29 \\ 0 & 0 & 29 & 87 & -87 \\ 0 & 0 & -501 & -1503 & 1503 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } \times= \left(\frac{1}{29}\right)} \begin{pmatrix} 1 & 0 & -66 & -198 & 199 \\ 0 & 1 & 10 & 30 & -29 \\ 0 & 0 & 1 & 3 & -3 \\ 0 & 0 & -501 & -1503 & 1503 \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line3}\times(66)} \begin{pmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 10 & 30 & -29 \\ 0 & 0 & 1 & 3 & -3 \\ 0 & 0 & -501 & -1503 & 1503 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line3}\times(10)} \begin{pmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 3 & -3 \\ 0 & 0 & -501 & -1503 & 1503 \end{pmatrix} \xrightarrow{\text{line4 += line3}\times(501)} \begin{pmatrix} 1 & 0 & 0 & 0 & 1 \\ 0 & 1 & 0 & 0 & 1 \\ 0 & 0 & 1 & 3 & -3 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -5 & 2 & -3 & -2 & 4 \\ 0 & 0 & -1 & -4 & -1 \\ 3 & -3 & 1 & 9 & 5 \\ 4 & -2 & 3 & 6 & -1 \end{pmatrix} \xrightarrow{\text{line4 } -= \text{ line3}} \begin{pmatrix} -5 & 2 & -3 & -2 & 4 \\ 0 & 0 & -1 & -4 & -1 \\ 3 & -3 & 1 & 9 & 5 \\ 1 & 1 & 2 & -3 & -6 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 1 & 2 & -3 & -6 \\ 0 & 0 & -1 & -4 & -1 \\ 3 & -3 & 1 & 9 & 5 \\ -5 & 2 & -3 & -2 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } -= \text{ line1}\times(3)} \begin{pmatrix} 1 & 1 & 2 & -3 & -6 \\ 0 & 0 & -1 & -4 & -1 \\ 0 & -6 & -5 & 18 & 23 \\ -5 & 2 & -3 & -2 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } += \text{ line1}\times(5)} \begin{pmatrix} 1 & 1 & 2 & -3 & -6 \\ 0 & 0 & -1 & -4 & -1 \\ 0 & -6 & -5 & 18 & 23 \\ 0 & 7 & 7 & -17 & -26 \end{pmatrix} \xrightarrow{\text{line3 } += \text{ line4}} \begin{pmatrix} 1 & 1 & 2 & -3 & -6 \\ 0 & 0 & -1 & -4 & -1 \\ 0 & 1 & 2 & 1 & -3 \\ 0 & 7 & 7 & -17 & -26 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } \leftrightarrow \text{ line3}} \begin{pmatrix} 1 & 1 & 2 & -3 & -6 \\ 0 & 1 & 2 & 1 & -3 \\ 0 & 0 & -1 & -4 & -1 \\ 0 & 7 & 7 & -17 & -26 \end{pmatrix} \xrightarrow{\text{line1 } -= \text{ line2}} \begin{pmatrix} 1 & 0 & 0 & -4 & -3 \\ 0 & 1 & 2 & 1 & -3 \\ 0 & 0 & -1 & -4 & -1 \\ 0 & 7 & 7 & -17 & -26 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } -= \text{ line2}\times(7)} \begin{pmatrix} 1 & 0 & 0 & -4 & -3 \\ 0 & 1 & 2 & 1 & -3 \\ 0 & 0 & -1 & -4 & -1 \\ 0 & 0 & -7 & -24 & -5 \end{pmatrix} \xrightarrow{\text{line3 } \times= (-1)} \begin{pmatrix} 1 & 0 & 0 & -4 & -3 \\ 0 & 1 & 2 & 1 & -3 \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & -7 & -24 & -5 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } -= \text{ line3}\times(2)} \begin{pmatrix} 1 & 0 & 0 & -4 & -3 \\ 0 & 1 & 0 & -7 & -5 \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & -7 & -24 & -5 \end{pmatrix} \xrightarrow{\text{line4 } += \text{ line3}\times(7)} \begin{pmatrix} 1 & 0 & 0 & -4 & -3 \\ 0 & 1 & 0 & -7 & -5 \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & 0 & 4 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } \times= \left(\frac{1}{4}\right)} \begin{pmatrix} 1 & 0 & 0 & -4 & -3 \\ 0 & 1 & 0 & -7 & -5 \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix} \xrightarrow{\text{line1 } += \text{ line4}\times(4)} \begin{pmatrix} 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & -7 & -5 \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix}$$

$$\xrightarrow{\text{line2 } += \text{ line4}\times(7)} \begin{pmatrix} 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 & -\frac{3}{2} \\ 0 & 0 & 1 & 4 & 1 \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix} \xrightarrow{\text{line3 } -= \text{ line4}\times(4)} \begin{pmatrix} 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 & -\frac{3}{2} \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix}$$

$$\begin{pmatrix} -5 & 3 & 0 & 9 & 0 \\ -8 & 2 & 1 & -2 & -5 \\ 4 & -1 & 0 & -4 & -1 \\ 9 & 0 & -1 & 6 & 3 \end{pmatrix} \xrightarrow{\text{line2 += line4}} \begin{pmatrix} -5 & 3 & 0 & 9 & 0 \\ 1 & 2 & 0 & 4 & -2 \\ 4 & -1 & 0 & -4 & -1 \\ 9 & 0 & -1 & 6 & 3 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line2}} \begin{pmatrix} 1 & 2 & 0 & 4 & -2 \\ -5 & 3 & 0 & 9 & 0 \\ 4 & -1 & 0 & -4 & -1 \\ 9 & 0 & -1 & 6 & 3 \end{pmatrix}$$

$$\xrightarrow{\text{line2 += line1}\times(5)} \begin{pmatrix} 1 & 2 & 0 & 4 & -2 \\ 0 & 13 & 0 & 29 & -10 \\ 4 & -1 & 0 & -4 & -1 \\ 9 & 0 & -1 & 6 & 3 \end{pmatrix} \xrightarrow{\text{line3 -= line1}\times(4)} \begin{pmatrix} 1 & 2 & 0 & 4 & -2 \\ 0 & 13 & 0 & 29 & -10 \\ 0 & -9 & 0 & -20 & 7 \\ 9 & 0 & -1 & 6 & 3 \end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line1}\times(9)} \begin{pmatrix} 1 & 2 & 0 & 4 & -2 \\ 0 & 13 & 0 & 29 & -10 \\ 0 & -9 & 0 & -20 & 7 \\ 0 & -18 & -1 & -30 & 21 \end{pmatrix} \xrightarrow{\text{line2 } \times = \left(\frac{1}{13}\right)} \begin{pmatrix} 1 & 2 & 0 & 4 & -2 \\ 0 & 1 & 0 & \frac{29}{13} & -\frac{10}{13} \\ 0 & -9 & 0 & -20 & 7 \\ 0 & -18 & -1 & -30 & 21 \end{pmatrix}$$

$$\xrightarrow{\text{line1 -= line2}\times(2)} \begin{pmatrix} 1 & 0 & 0 & -\frac{6}{13} & -\frac{6}{13} \\ 0 & 1 & 0 & \frac{29}{13} & -\frac{10}{13} \\ 0 & -9 & 0 & -20 & 7 \\ 0 & -18 & -1 & -30 & 21 \end{pmatrix}$$

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$$\xrightarrow{\text{line3 += line2}\times(9)} \begin{pmatrix} 1 & 0 & 0 & -\frac{6}{13} & -\frac{6}{13} \\ 0 & 1 & 0 & \frac{29}{13} & -\frac{10}{13} \\ 0 & 0 & 0 & \frac{1}{13} & \frac{1}{13} \\ 0 & -18 & -1 & -30 & 21 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2}\times(18)} \begin{pmatrix} 1 & 0 & 0 & -\frac{6}{13} & -\frac{6}{13} \\ 0 & 1 & 0 & \frac{29}{13} & -\frac{10}{13} \\ 0 & 0 & 0 & \frac{1}{13} & \frac{1}{13} \\ 0 & 0 & -1 & \frac{132}{13} & \frac{93}{13} \end{pmatrix} \xrightarrow{\text{line3 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 0 & 0 & -\frac{6}{13} & -\frac{6}{13} \\ 0 & 1 & 0 & \frac{29}{13} & -\frac{10}{13} \\ 0 & 0 & -1 & \frac{132}{13} & \frac{93}{13} \\ 0 & 0 & 0 & \frac{1}{13} & \frac{1}{13} \end{pmatrix}$$

$$\xrightarrow{\text{line3 } \times = (-1)} \begin{pmatrix} 1 & 0 & 0 & -\frac{6}{13} & -\frac{6}{13} \\ 0 & 1 & 0 & \frac{29}{13} & -\frac{10}{13} \\ 0 & 0 & 1 & -\frac{132}{13} & -\frac{93}{13} \\ 0 & 0 & 0 & \frac{1}{13} & \frac{1}{13} \end{pmatrix} \xrightarrow{\text{line4 } \times = (13)} \begin{pmatrix} 1 & 0 & 0 & -\frac{6}{13} & -\frac{6}{13} \\ 0 & 1 & 0 & \frac{29}{13} & -\frac{10}{13} \\ 0 & 0 & 1 & -\frac{132}{13} & -\frac{93}{13} \\ 0 & 0 & 0 & 1 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line4}\times\left(\frac{6}{13}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & \frac{29}{13} & -\frac{10}{13} \\ 0 & 0 & 1 & -\frac{132}{13} & -\frac{93}{13} \\ 0 & 0 & 0 & 1 & 1 \end{pmatrix} \xrightarrow{\text{line2 -= line4}\times\left(\frac{29}{13}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & -3 \\ 0 & 0 & 1 & -\frac{132}{13} & -\frac{93}{13} \\ 0 & 0 & 0 & 1 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line4}\times\left(\frac{132}{13}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & -3 \\ 0 & 0 & 1 & 0 & 3 \\ 0 & 0 & 0 & 1 & 1 \end{pmatrix}$$

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

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

$$\xrightarrow{\text{line4 -= line1}\times(2)} \begin{pmatrix} 1 & 3 & 1 & 1 & 1 \\ 0 & 2 & 2 & -1 & 0 \\ 0 & 6 & 6 & 3 & 6 \\ 0 & 2 & 2 & 3 & 4 \end{pmatrix} \xrightarrow{\text{line2 -= line4}} \begin{pmatrix} 1 & 3 & 1 & 1 & 1 \\ 0 & 0 & 0 & -4 & -4 \\ 0 & 6 & 6 & 3 & 6 \\ 0 & 2 & 2 & 3 & 4 \end{pmatrix}$$

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

$$\xrightarrow{\text{line4 -= line2}\times(2)} \begin{pmatrix} 1 & 0 & -2 & -\frac{1}{2} & -2 \\ 0 & 1 & 1 & \frac{1}{2} & 1 \\ 0 & 0 & 0 & -4 & -4 \\ 0 & 0 & 0 & 2 & 2 \end{pmatrix} \xrightarrow{\text{line3 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 0 & -2 & -\frac{1}{2} & -2 \\ 0 & 1 & 1 & \frac{1}{2} & 1 \\ 0 & 0 & 0 & 2 & 2 \\ 0 & 0 & 0 & -4 & -4 \end{pmatrix} \xrightarrow{\text{line3 } \times = \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & -2 & -\frac{1}{2} & -2 \\ 0 & 1 & 1 & \frac{1}{2} & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & -4 & -4 \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line3}\times\left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & -2 & 0 & -\frac{3}{2} \\ 0 & 1 & 1 & \frac{1}{2} & 1 \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & -4 & -4 \end{pmatrix} \xrightarrow{\text{line2 -= line3}\times\left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & -2 & 0 & -\frac{3}{2} \\ 0 & 1 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & -4 & -4 \end{pmatrix} \xrightarrow{\text{line4 += line3}\times(4)} \begin{pmatrix} 1 & 0 & -2 & 0 & -\frac{3}{2} \\ 0 & 1 & 1 & 0 & \frac{1}{2} \\ 0 & 0 & 0 & 1 & 1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} -3 & -1 & -1 & -6 & 1 \\ 1 & 2 & 1 & -2 & 0 \\ -5 & -8 & -7 & 5 & 1 \\ -1 & -2 & 3 & 2 & -1 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} 1 & 2 & 1 & -2 & 0 \\ -3 & -1 & -1 & -6 & 1 \\ -5 & -8 & -7 & 5 & 1 \\ -1 & -2 & 3 & 2 & -1 \end{pmatrix} \xrightarrow{\text{line2 += line1}\times(3)} \begin{pmatrix} 1 & 2 & 1 & -2 & 0 \\ 0 & 5 & 2 & -12 & 1 \\ -5 & -8 & -7 & 5 & 1 \\ -1 & -2 & 3 & 2 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line1}\times(5)} \begin{pmatrix} 1 & 2 & 1 & -2 & 0 \\ 0 & 5 & 2 & -12 & 1 \\ 0 & 2 & -2 & -5 & 1 \\ -1 & -2 & 3 & 2 & -1 \end{pmatrix} \xrightarrow{\text{line4 += line1}} \begin{pmatrix} 1 & 2 & 1 & -2 & 0 \\ 0 & 5 & 2 & -12 & 1 \\ 0 & 2 & -2 & -5 & 1 \\ 0 & 0 & 4 & 0 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line3}\times(2)} \begin{pmatrix} 1 & 2 & 1 & -2 & 0 \\ 0 & 1 & 6 & -2 & -1 \\ 0 & 2 & -2 & -5 & 1 \\ 0 & 0 & 4 & 0 & -1 \end{pmatrix} \xrightarrow{\text{line1 -= line2}\times(2)} \begin{pmatrix} 1 & 0 & -11 & 2 & 2 \\ 0 & 1 & 6 & -2 & -1 \\ 0 & 2 & -2 & -5 & 1 \\ 0 & 0 & 4 & 0 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line2}\times(2)} \begin{pmatrix} 1 & 0 & -11 & 2 & 2 \\ 0 & 1 & 6 & -2 & -1 \\ 0 & 0 & -14 & -1 & 3 \\ 0 & 0 & 4 & 0 & -1 \end{pmatrix} \xrightarrow{\text{line3 }\times=\left(-\frac{1}{14}\right)} \begin{pmatrix} 1 & 0 & -11 & 2 & 2 \\ 0 & 1 & 6 & -2 & -1 \\ 0 & 0 & 1 & \frac{1}{14} & -\frac{3}{14} \\ 0 & 0 & 4 & 0 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line3}\times(11)} \begin{pmatrix} 1 & 0 & 0 & \frac{39}{14} & -\frac{5}{14} \\ 0 & 1 & 6 & -2 & -1 \\ 0 & 0 & 1 & \frac{1}{14} & -\frac{3}{14} \\ 0 & 0 & 4 & 0 & -1 \end{pmatrix} \xrightarrow{\text{line2 -= line3}\times(6)} \begin{pmatrix} 1 & 0 & 0 & \frac{39}{14} & -\frac{5}{14} \\ 0 & 1 & 0 & -\frac{17}{7} & \frac{2}{7} \\ 0 & 0 & 1 & \frac{1}{14} & -\frac{3}{14} \\ 0 & 0 & 4 & 0 & -1 \end{pmatrix}$$

$$\xrightarrow{\text{line4 -= line3}\times(4)} \begin{pmatrix} 1 & 0 & 0 & \frac{39}{14} & -\frac{5}{14} \\ 0 & 1 & 0 & -\frac{17}{7} & \frac{2}{7} \\ 0 & 0 & 1 & \frac{1}{14} & -\frac{3}{14} \\ 0 & 0 & 0 & -\frac{2}{7} & -\frac{1}{7} \end{pmatrix} \xrightarrow{\text{line4 }\times=\left(-\frac{7}{2}\right)} \begin{pmatrix} 1 & 0 & 0 & \frac{39}{14} & -\frac{5}{14} \\ 0 & 1 & 0 & -\frac{17}{7} & \frac{2}{7} \\ 0 & 0 & 1 & \frac{1}{14} & -\frac{3}{14} \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix}$$

$$\xrightarrow{\text{line1 -= line4}\times\left(\frac{39}{14}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & -\frac{7}{4} \\ 0 & 1 & 0 & -\frac{17}{7} & \frac{2}{7} \\ 0 & 0 & 1 & \frac{1}{14} & -\frac{3}{14} \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix} \xrightarrow{\text{line2 += line4}\times\left(\frac{17}{7}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & -\frac{7}{4} \\ 0 & 1 & 0 & 0 & \frac{3}{2} \\ 0 & 0 & 1 & \frac{1}{14} & -\frac{3}{14} \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line4}\times\left(\frac{1}{14}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & -\frac{7}{4} \\ 0 & 1 & 0 & 0 & \frac{3}{2} \\ 0 & 0 & 1 & 0 & -\frac{1}{4} \\ 0 & 0 & 0 & 1 & \frac{1}{2} \end{pmatrix}$$

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$$\begin{pmatrix} -2 & 1 & 0 & 1 & -5 \\ 4 & -3 & 1 & -5 & 2 \\ -5 & 3 & -3 & 9 & 0 \\ -3 & 2 & -1 & 4 & -2 \end{pmatrix} \xrightarrow{\text{line1 -= line4}} \begin{pmatrix} 1 & -1 & 1 & -3 & -3 \\ 4 & -3 & 1 & -5 & 2 \\ -5 & 3 & -3 & 9 & 0 \\ -3 & 2 & -1 & 4 & -2 \end{pmatrix} \xrightarrow{\text{line2 -= line1×(4)}} \begin{pmatrix} 1 & -1 & 1 & -3 & -3 \\ 0 & 1 & -3 & 7 & 14 \\ -5 & 3 & -3 & 9 & 0 \\ -3 & 2 & -1 & 4 & -2 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line1×(5)}} \begin{pmatrix} 1 & -1 & 1 & -3 & -3 \\ 0 & 1 & -3 & 7 & 14 \\ 0 & -2 & 2 & -6 & -15 \\ -3 & 2 & -1 & 4 & -2 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line1×(3)}} \begin{pmatrix} 1 & -1 & 1 & -3 & -3 \\ 0 & 1 & -3 & 7 & 14 \\ 0 & -2 & 2 & -6 & -15 \\ 0 & -1 & 2 & -5 & -11 \end{pmatrix} \xrightarrow{\text{line1 += line2}} \begin{pmatrix} 1 & 0 & -2 & 4 & 11 \\ 0 & 1 & -3 & 7 & 14 \\ 0 & -2 & 2 & -6 & -15 \\ 0 & -1 & 2 & -5 & -11 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line2×(2)}} \begin{pmatrix} 1 & 0 & -2 & 4 & 11 \\ 0 & 1 & -3 & 7 & 14 \\ 0 & 0 & -4 & 8 & 13 \\ 0 & -1 & 2 & -5 & -11 \end{pmatrix} \xrightarrow{\text{line4 += line2}} \begin{pmatrix} 1 & 0 & -2 & 4 & 11 \\ 0 & 1 & -3 & 7 & 14 \\ 0 & 0 & -4 & 8 & 13 \\ 0 & 0 & -1 & 2 & 3 \end{pmatrix}$$

$$\xrightarrow{\text{line3 ↔ line4}} \begin{pmatrix} 1 & 0 & -2 & 4 & 11 \\ 0 & 1 & -3 & 7 & 14 \\ 0 & 0 & -1 & 2 & 3 \\ 0 & 0 & -4 & 8 & 13 \end{pmatrix} \xrightarrow{\text{line3 ×= (−1)}} \begin{pmatrix} 1 & 0 & -2 & 4 & 11 \\ 0 & 1 & -3 & 7 & 14 \\ 0 & 0 & 1 & -2 & -3 \\ 0 & 0 & -4 & 8 & 13 \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line3×(2)}} \begin{pmatrix} 1 & 0 & 0 & 0 & 5 \\ 0 & 1 & -3 & 7 & 14 \\ 0 & 0 & 1 & -2 & -3 \\ 0 & 0 & -4 & 8 & 13 \end{pmatrix} \xrightarrow{\text{line2 += line3×(3)}} \begin{pmatrix} 1 & 0 & 0 & 0 & 5 \\ 0 & 1 & 0 & 1 & 5 \\ 0 & 0 & 1 & -2 & -3 \\ 0 & 0 & -4 & 8 & 13 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line3×(4)}} \begin{pmatrix} 1 & 0 & 0 & 0 & 5 \\ 0 & 1 & 0 & 1 & 5 \\ 0 & 0 & 1 & -2 & -3 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line1 -= line4×(5)}} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 5 \\ 0 & 0 & 1 & -2 & -3 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 -= line4×(5)}} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & -2 & -3 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line3 += line4×(3)}} \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & -2 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\begin{pmatrix} -1 & -9 & 9 & -9 & 4 \\ 0 & -3 & 4 & -5 & 6 \\ 0 & 2 & -2 & 3 & -4 \\ 1 & 7 & 3 & -2 & 5 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 7 & 3 & -2 & 5 \\ 0 & -3 & 4 & -5 & 6 \\ 0 & 2 & -2 & 3 & -4 \\ -1 & -9 & 9 & -9 & 4 \end{pmatrix} \xrightarrow{\text{line4 } += \text{ line1}} \begin{pmatrix} 1 & 7 & 3 & -2 & 5 \\ 0 & -3 & 4 & -5 & 6 \\ 0 & 2 & -2 & 3 & -4 \\ 0 & -2 & 12 & -11 & 9 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } -= \text{ line2}} \begin{pmatrix} 1 & 7 & 3 & -2 & 5 \\ 0 & -3 & 4 & -5 & 6 \\ 0 & 2 & -2 & 3 & -4 \\ 0 & 1 & 8 & -6 & 3 \end{pmatrix} \xrightarrow{\text{line2 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 7 & 3 & -2 & 5 \\ 0 & 1 & 8 & -6 & 3 \\ 0 & 2 & -2 & 3 & -4 \\ 0 & -3 & 4 & -5 & 6 \end{pmatrix}$$

$$\xrightarrow{\text{line1 } -= \text{ line2}\times(7)} \begin{pmatrix} 1 & 0 & -53 & 40 & -16 \\ 0 & 1 & 8 & -6 & 3 \\ 0 & 2 & -2 & 3 & -4 \\ 0 & -3 & 4 & -5 & 6 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } -= \text{ line2}\times(2)} \begin{pmatrix} 1 & 0 & -53 & 40 & -16 \\ 0 & 1 & 8 & -6 & 3 \\ 0 & 0 & -18 & 15 & -10 \\ 0 & -3 & 4 & -5 & 6 \end{pmatrix}$$

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$$\xrightarrow{\text{line4 } += \text{ line2}\times(3)} \begin{pmatrix} 1 & 0 & -53 & 40 & -16 \\ 0 & 1 & 8 & -6 & 3 \\ 0 & 0 & -18 & 15 & -10 \\ 0 & 0 & 28 & -23 & 15 \end{pmatrix} \xrightarrow{\text{line3 } \times= \left(-\frac{1}{18}\right)} \begin{pmatrix} 1 & 0 & -53 & 40 & -16 \\ 0 & 1 & 8 & -6 & 3 \\ 0 & 0 & 1 & -\frac{5}{6} & \frac{5}{9} \\ 0 & 0 & 28 & -23 & 15 \end{pmatrix}$$

$$\xrightarrow{\text{line1 } += \text{ line3}\times(53)} \begin{pmatrix} 1 & 0 & 0 & -\frac{25}{6} & \frac{121}{9} \\ 0 & 1 & 8 & -6 & 3 \\ 0 & 0 & 1 & -\frac{5}{6} & \frac{5}{9} \\ 0 & 0 & 28 & -23 & 15 \end{pmatrix} \xrightarrow{\text{line2 } -= \text{ line3}\times(8)} \begin{pmatrix} 1 & 0 & 0 & -\frac{25}{6} & \frac{121}{9} \\ 0 & 1 & 0 & \frac{2}{3} & -\frac{13}{9} \\ 0 & 0 & 1 & -\frac{5}{6} & \frac{5}{9} \\ 0 & 0 & 28 & -23 & 15 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } -= \text{ line3}\times(28)} \begin{pmatrix} 1 & 0 & 0 & -\frac{25}{6} & \frac{121}{9} \\ 0 & 1 & 0 & \frac{2}{3} & -\frac{13}{9} \\ 0 & 0 & 1 & -\frac{5}{6} & \frac{5}{9} \\ 0 & 0 & 0 & \frac{1}{3} & -\frac{5}{9} \end{pmatrix} \xrightarrow{\text{line4 } \times= (3)} \begin{pmatrix} 1 & 0 & 0 & -\frac{25}{6} & \frac{121}{9} \\ 0 & 1 & 0 & \frac{2}{3} & -\frac{13}{9} \\ 0 & 0 & 1 & -\frac{5}{6} & \frac{5}{9} \\ 0 & 0 & 0 & 1 & -\frac{5}{3} \end{pmatrix}$$

$$\xrightarrow{\text{line1 } += \text{ line4}\times\left(\frac{25}{6}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & \frac{13}{2} \\ 0 & 1 & 0 & \frac{2}{3} & -\frac{13}{9} \\ 0 & 0 & 1 & -\frac{5}{6} & \frac{5}{9} \\ 0 & 0 & 0 & 1 & -\frac{5}{3} \end{pmatrix} \xrightarrow{\text{line2 } -= \text{ line4}\times\left(\frac{2}{3}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & \frac{13}{2} \\ 0 & 1 & 0 & 0 & -\frac{1}{3} \\ 0 & 0 & 1 & -\frac{5}{6} & \frac{5}{9} \\ 0 & 0 & 0 & 1 & -\frac{5}{3} \end{pmatrix}$$

$$\xrightarrow{\text{line3 } += \text{ line4}\times\left(\frac{5}{6}\right)} \begin{pmatrix} 1 & 0 & 0 & 0 & \frac{13}{2} \\ 0 & 1 & 0 & 0 & -\frac{1}{3} \\ 0 & 0 & 1 & 0 & -\frac{5}{6} \\ 0 & 0 & 0 & 1 & -\frac{5}{3} \end{pmatrix}$$

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

$$\xrightarrow{\text{line3 += line1}} \begin{pmatrix} 1 & -7 & 1 & 4 & 2 \\ 0 & 1 & -2 & -1 & 0 \\ 0 & -12 & 6 & 3 & 1 \\ -3 & 2 & 5 & -8 & -4 \end{pmatrix} \xrightarrow{\text{line4 += line1}\times(3)} \begin{pmatrix} 1 & -7 & 1 & 4 & 2 \\ 0 & 1 & -2 & -1 & 0 \\ 0 & -12 & 6 & 3 & 1 \\ 0 & -19 & 8 & 4 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line2}\times(7)} \begin{pmatrix} 1 & 0 & -13 & -3 & 2 \\ 0 & 1 & -2 & -1 & 0 \\ 0 & -12 & 6 & 3 & 1 \\ 0 & -19 & 8 & 4 & 2 \end{pmatrix} \xrightarrow{\text{line3 += line2}\times(12)} \begin{pmatrix} 1 & 0 & -13 & -3 & 2 \\ 0 & 1 & -2 & -1 & 0 \\ 0 & 0 & -18 & -9 & 1 \\ 0 & -19 & 8 & 4 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2}\times(19)} \begin{pmatrix} 1 & 0 & -13 & -3 & 2 \\ 0 & 1 & -2 & -1 & 0 \\ 0 & 0 & -18 & -9 & 1 \\ 0 & 0 & -30 & -15 & 2 \end{pmatrix} \xrightarrow{\text{line3 }\times=\left(-\frac{1}{18}\right)} \begin{pmatrix} 1 & 0 & -13 & -3 & 2 \\ 0 & 1 & -2 & -1 & 0 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{18} \\ 0 & 0 & -30 & -15 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line1 += line3}\times(13)} \begin{pmatrix} 1 & 0 & 0 & \frac{7}{2} & \frac{23}{18} \\ 0 & 1 & -2 & -1 & 0 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{18} \\ 0 & 0 & -30 & -15 & 2 \end{pmatrix} \xrightarrow{\text{line2 += line3}\times(2)} \begin{pmatrix} 1 & 0 & 0 & \frac{7}{2} & \frac{23}{18} \\ 0 & 1 & 0 & 0 & -\frac{1}{9} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{18} \\ 0 & 0 & -30 & -15 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line4 += line3}\times(30)} \begin{pmatrix} 1 & 0 & 0 & \frac{7}{2} & \frac{23}{18} \\ 0 & 1 & 0 & 0 & -\frac{1}{9} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{18} \\ 0 & 0 & 0 & 0 & \frac{1}{3} \end{pmatrix} \xrightarrow{\text{line4 }\times=(3)} \begin{pmatrix} 1 & 0 & 0 & \frac{7}{2} & \frac{23}{18} \\ 0 & 1 & 0 & 0 & -\frac{1}{9} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{18} \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line1 -= line4}\times\left(\frac{23}{18}\right)} \begin{pmatrix} 1 & 0 & 0 & \frac{7}{2} & 0 \\ 0 & 1 & 0 & 0 & -\frac{1}{9} \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{18} \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line2 += line4}\times\left(\frac{1}{9}\right)} \begin{pmatrix} 1 & 0 & 0 & \frac{7}{2} & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} & -\frac{1}{18} \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line3 += line4}\times\left(\frac{1}{18}\right)} \begin{pmatrix} 1 & 0 & 0 & \frac{7}{2} & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & \frac{1}{2} & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

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

$$\xrightarrow{\text{line2} -= \text{line1} \times (4)} \begin{pmatrix} 1 & 2 & -1 & 0 & -1 \\ 0 & -3 & 2 & -1 & -2 \\ -2 & 6 & -3 & 5 & 7 \\ -3 & 3 & -1 & 5 & 7 \end{pmatrix} \xrightarrow{\text{line3} += \text{line1} \times (2)} \begin{pmatrix} 1 & 2 & -1 & 0 & -1 \\ 0 & -3 & 2 & -1 & -2 \\ 0 & 10 & -5 & 5 & 5 \\ -3 & 3 & -1 & 5 & 7 \end{pmatrix}$$

$$\xrightarrow{\text{line4} += \text{line1} \times (3)} \begin{pmatrix} 1 & 2 & -1 & 0 & -1 \\ 0 & -3 & 2 & -1 & -2 \\ 0 & 10 & -5 & 5 & 5 \\ 0 & 9 & -4 & 5 & 4 \end{pmatrix} \xrightarrow{\text{line3} -= \text{line4}} \begin{pmatrix} 1 & 2 & -1 & 0 & -1 \\ 0 & -3 & 2 & -1 & -2 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 9 & -4 & 5 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 2 & -1 & 0 & -1 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & -3 & 2 & -1 & -2 \\ 0 & 9 & -4 & 5 & 4 \end{pmatrix} \xrightarrow{\text{line1} -= \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 1 & 0 & -3 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & -3 & 2 & -1 & -2 \\ 0 & 9 & -4 & 5 & 4 \end{pmatrix}$$

$$\xrightarrow{\text{line3} += \text{line2} \times (3)} \begin{pmatrix} 1 & 0 & 1 & 0 & -3 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 0 & -1 & -1 & 1 \\ 0 & 9 & -4 & 5 & 4 \end{pmatrix} \xrightarrow{\text{line4} -= \text{line2} \times (9)} \begin{pmatrix} 1 & 0 & 1 & 0 & -3 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 0 & -1 & -1 & 1 \\ 0 & 0 & 5 & 5 & -5 \end{pmatrix}$$

$$\xrightarrow{\text{line3} \leftrightarrow \text{line4}} \begin{pmatrix} 1 & 0 & 1 & 0 & -3 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 0 & 5 & 5 & -5 \\ 0 & 0 & -1 & -1 & 1 \end{pmatrix} \xrightarrow{\text{line3} \times= \left(\frac{1}{5}\right)} \begin{pmatrix} 1 & 0 & 1 & 0 & -3 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 0 & 1 & 1 & -1 \\ 0 & 0 & -1 & -1 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line1} -= \text{line3}} \begin{pmatrix} 1 & 0 & 0 & -1 & -2 \\ 0 & 1 & -1 & 0 & 1 \\ 0 & 0 & 1 & 1 & -1 \\ 0 & 0 & -1 & -1 & 1 \end{pmatrix} \xrightarrow{\text{line2} += \text{line3}} \begin{pmatrix} 1 & 0 & 0 & -1 & -2 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & -1 \\ 0 & 0 & -1 & -1 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line4} += \text{line3}} \begin{pmatrix} 1 & 0 & 0 & -1 & -2 \\ 0 & 1 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 & -1 \\ 0 & 0 & 0 & 0 & 0 \end{pmatrix}$$

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$$\begin{pmatrix} 5 & -1 & -3 & 5 & -5 \\ 8 & 1 & -2 & 8 & 7 \\ 1 & 3 & 3 & 1 & 9 \\ -2 & 2 & 3 & -2 & 8 \end{pmatrix} \xrightarrow{\text{line1 } \leftrightarrow \text{ line3}} \begin{pmatrix} 1 & 3 & 3 & 1 & 9 \\ 8 & 1 & -2 & 8 & 7 \\ 5 & -1 & -3 & 5 & -5 \\ -2 & 2 & 3 & -2 & 8 \end{pmatrix} \xrightarrow{\text{line2 } -= \text{ line1}\times(8)} \begin{pmatrix} 1 & 3 & 3 & 1 & 9 \\ 0 & -23 & -26 & 0 & -65 \\ 5 & -1 & -3 & 5 & -5 \\ -2 & 2 & 3 & -2 & 8 \end{pmatrix}$$

$$\xrightarrow{\text{line3 } -= \text{ line1}\times(5)} \begin{pmatrix} 1 & 3 & 3 & 1 & 9 \\ 0 & -23 & -26 & 0 & -65 \\ 0 & -16 & -18 & 0 & -50 \\ -2 & 2 & 3 & -2 & 8 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } += \text{ line1}\times(2)} \begin{pmatrix} 1 & 3 & 3 & 1 & 9 \\ 0 & -23 & -26 & 0 & -65 \\ 0 & -16 & -18 & 0 & -50 \\ 0 & 8 & 9 & 0 & 26 \end{pmatrix} \xrightarrow{\text{line2 } += \text{ line4}\times(3)} \begin{pmatrix} 1 & 3 & 3 & 1 & 9 \\ 0 & 1 & 1 & 0 & 13 \\ 0 & -16 & -18 & 0 & -50 \\ 0 & 8 & 9 & 0 & 26 \end{pmatrix}$$

$$\xrightarrow{\text{line1 } -= \text{ line2}\times(3)} \begin{pmatrix} 1 & 0 & 0 & 1 & -30 \\ 0 & 1 & 1 & 0 & 13 \\ 0 & -16 & -18 & 0 & -50 \\ 0 & 8 & 9 & 0 & 26 \end{pmatrix} \xrightarrow{\text{line3 } += \text{ line2}\times(16)} \begin{pmatrix} 1 & 0 & 0 & 1 & -30 \\ 0 & 1 & 1 & 0 & 13 \\ 0 & 0 & -2 & 0 & 158 \\ 0 & 8 & 9 & 0 & 26 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } -= \text{ line2}\times(8)} \begin{pmatrix} 1 & 0 & 0 & 1 & -30 \\ 0 & 1 & 1 & 0 & 13 \\ 0 & 0 & -2 & 0 & 158 \\ 0 & 0 & 1 & 0 & -78 \end{pmatrix} \xrightarrow{\text{line3 } \leftrightarrow \text{ line4}} \begin{pmatrix} 1 & 0 & 0 & 1 & -30 \\ 0 & 1 & 1 & 0 & 13 \\ 0 & 0 & 1 & 0 & -78 \\ 0 & 0 & -2 & 0 & 158 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } -= \text{ line3}} \begin{pmatrix} 1 & 0 & 0 & 1 & -30 \\ 0 & 1 & 0 & 0 & 91 \\ 0 & 0 & 1 & 0 & -78 \\ 0 & 0 & -2 & 0 & 158 \end{pmatrix} \xrightarrow{\text{line4 } += \text{ line3}\times(2)} \begin{pmatrix} 1 & 0 & 0 & 1 & -30 \\ 0 & 1 & 0 & 0 & 91 \\ 0 & 0 & 1 & 0 & -78 \\ 0 & 0 & 0 & 0 & 2 \end{pmatrix}$$

$$\xrightarrow{\text{line4 } \times= \left(\frac{1}{2}\right)} \begin{pmatrix} 1 & 0 & 0 & 1 & -30 \\ 0 & 1 & 0 & 0 & 91 \\ 0 & 0 & 1 & 0 & -78 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line1 } += \text{ line4}\times(30)} \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 91 \\ 0 & 0 & 1 & 0 & -78 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2 } -= \text{ line4}\times(91)} \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & -78 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line3 } += \text{ line4}\times(78)} \begin{pmatrix} 1 & 0 & 0 & 1 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

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$$\begin{pmatrix}-4&1&8&8&-9\\2&-3&-1&6&-5\\3&0&-6&-7&9\\-5&3&6&-1&-4\end{pmatrix}\xrightarrow{\text{line1 -= line4}}\begin{pmatrix}1&-2&2&9&-5\\2&-3&-1&6&-5\\3&0&-6&-7&9\\-5&3&6&-1&-4\end{pmatrix}\xrightarrow{\text{line2 -= line1×(2)}}\begin{pmatrix}1&-2&2&9&-5\\0&1&-5&-12&5\\3&0&-6&-7&9\\-5&3&6&-1&-4\end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line1×(3)}}\begin{pmatrix}1&-2&2&9&-5\\0&1&-5&-12&5\\0&6&-12&-34&24\\-5&3&6&-1&-4\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line1×(5)}}\begin{pmatrix}1&-2&2&9&-5\\0&1&-5&-12&5\\0&6&-12&-34&24\\0&-7&16&44&-29\end{pmatrix}$$

$$\xrightarrow{\text{line1 += line2×(2)}}\begin{pmatrix}1&0&-8&-15&5\\0&1&-5&-12&5\\0&6&-12&-34&24\\0&-7&16&44&-29\end{pmatrix}$$

$$\xrightarrow{\text{line3 -= line2×(6)}}\begin{pmatrix}1&0&-8&-15&5\\0&1&-5&-12&5\\0&0&18&38&-6\\0&-7&16&44&-29\end{pmatrix}$$

$$\xrightarrow{\text{line4 += line2×(7)}}\begin{pmatrix}1&0&-8&-15&5\\0&1&-5&-12&5\\0&0&18&38&-6\\0&0&-19&-40&6\end{pmatrix}\xrightarrow{\text{line3 += line4}}\begin{pmatrix}1&0&-8&-15&5\\0&1&-5&-12&5\\0&0&-1&-2&0\\0&0&-19&-40&6\end{pmatrix}$$

$$\xrightarrow{\text{line3 ×= (−1)}}\begin{pmatrix}1&0&-8&-15&5\\0&1&-5&-12&5\\0&0&1&2&0\\0&0&-19&-40&6\end{pmatrix}\xrightarrow{\text{line1 += line3×(8)}}\begin{pmatrix}1&0&0&1&5\\0&1&-5&-12&5\\0&0&1&2&0\\0&0&-19&-40&6\end{pmatrix}$$

$$\xrightarrow{\text{line2 += line3×(5)}}\begin{pmatrix}1&0&0&1&5\\0&1&0&-2&5\\0&0&1&2&0\\0&0&-19&-40&6\end{pmatrix}\xrightarrow{\text{line4 += line3×(19)}}\begin{pmatrix}1&0&0&1&5\\0&1&0&-2&5\\0&0&1&2&0\\0&0&0&-2&6\end{pmatrix}$$

$$\xrightarrow{\text{line4 ×= }\left(-\frac{1}{2}\right)}\begin{pmatrix}1&0&0&1&5\\0&1&0&-2&5\\0&0&1&2&0\\0&0&0&1&-3\end{pmatrix}\xrightarrow{\text{line1 -= line4}}\begin{pmatrix}1&0&0&0&8\\0&1&0&-2&5\\0&0&1&2&0\\0&0&0&1&-3\end{pmatrix}$$

$$\xrightarrow{\text{line2 += line4×(2)}}\begin{pmatrix}1&0&0&0&8\\0&1&0&0&-1\\0&0&1&2&0\\0&0&0&1&-3\end{pmatrix}\xrightarrow{\text{line3 -= line4×(2)}}\begin{pmatrix}1&0&0&0&8\\0&1&0&0&-1\\0&0&1&0&6\\0&0&0&1&-3\end{pmatrix}$$

$$
\begin{pmatrix} -1 & 8 & -2 & 1 & 1 \\ -2 & -1 & 0 & 4 & 2 \\ 3 & -6 & 4 & -9 & -3 \\ -2 & -8 & 1 & 6 & 2 \end{pmatrix}
\xrightarrow{\text{line1 } \times= (-1)}
\begin{pmatrix} 1 & -8 & 2 & -1 & -1 \\ -2 & -1 & 0 & 4 & 2 \\ 3 & -6 & 4 & -9 & -3 \\ -2 & -8 & 1 & 6 & 2 \end{pmatrix}
\xrightarrow{\text{line2 } += \text{ line1}\times(2)}
\begin{pmatrix} 1 & -8 & 2 & -1 & -1 \\ 0 & -17 & 4 & 2 & 0 \\ 3 & -6 & 4 & -9 & -3 \\ -2 & -8 & 1 & 6 & 2 \end{pmatrix}
$$

$$
\xrightarrow{\text{line3 } -= \text{ line1}\times(3)}
\begin{pmatrix} 1 & -8 & 2 & -1 & -1 \\ 0 & -17 & 4 & 2 & 0 \\ 0 & 18 & -2 & -6 & 0 \\ -2 & -8 & 1 & 6 & 2 \end{pmatrix}
\xrightarrow{\text{line4 } += \text{ line1}\times(2)}
\begin{pmatrix} 1 & -8 & 2 & -1 & -1 \\ 0 & -17 & 4 & 2 & 0 \\ 0 & 18 & -2 & -6 & 0 \\ 0 & -24 & 5 & 4 & 0 \end{pmatrix}
$$

$$
\xrightarrow{\text{line2 } += \text{ line3}}
\begin{pmatrix} 1 & -8 & 2 & -1 & -1 \\ 0 & 1 & 2 & -4 & 0 \\ 0 & 18 & -2 & -6 & 0 \\ 0 & -24 & 5 & 4 & 0 \end{pmatrix}
\xrightarrow{\text{line1 } += \text{ line2}\times(8)}
\begin{pmatrix} 1 & 0 & 18 & -33 & -1 \\ 0 & 1 & 2 & -4 & 0 \\ 0 & 18 & -2 & -6 & 0 \\ 0 & -24 & 5 & 4 & 0 \end{pmatrix}
$$

$$
\xrightarrow{\text{line3 } -= \text{ line2}\times(18)}
\begin{pmatrix} 1 & 0 & 18 & -33 & -1 \\ 0 & 1 & 2 & -4 & 0 \\ 0 & 0 & -38 & 66 & 0 \\ 0 & -24 & 5 & 4 & 0 \end{pmatrix}
$$

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$$
\xrightarrow{\text{line4 } += \text{ line2}\times(24)}
\begin{pmatrix} 1 & 0 & 18 & -33 & -1 \\ 0 & 1 & 2 & -4 & 0 \\ 0 & 0 & -38 & 66 & 0 \\ 0 & 0 & 53 & -92 & 0 \end{pmatrix}
\xrightarrow{\text{line3 } \times= \left(-\frac{1}{38}\right)}
\begin{pmatrix} 1 & 0 & 18 & -33 & -1 \\ 0 & 1 & 2 & -4 & 0 \\ 0 & 0 & 1 & -\frac{33}{19} & 0 \\ 0 & 0 & 53 & -92 & 0 \end{pmatrix}
$$

$$
\xrightarrow{\text{line1 } -= \text{ line3}\times(18)}
\begin{pmatrix} 1 & 0 & 0 & -\frac{33}{19} & -1 \\ 0 & 1 & 2 & -4 & 0 \\ 0 & 0 & 1 & -\frac{33}{19} & 0 \\ 0 & 0 & 53 & -92 & 0 \end{pmatrix}
\xrightarrow{\text{line2 } -= \text{ line3}\times(2)}
\begin{pmatrix} 1 & 0 & 0 & -\frac{33}{19} & -1 \\ 0 & 1 & 0 & -\frac{10}{19} & 0 \\ 0 & 0 & 1 & -\frac{33}{19} & 0 \\ 0 & 0 & 53 & -92 & 0 \end{pmatrix}
$$

$$
\xrightarrow{\text{line4 } -= \text{ line3}\times(53)}
\begin{pmatrix} 1 & 0 & 0 & -\frac{33}{19} & -1 \\ 0 & 1 & 0 & -\frac{10}{19} & 0 \\ 0 & 0 & 1 & -\frac{33}{19} & 0 \\ 0 & 0 & 0 & \frac{1}{19} & 0 \end{pmatrix}
\xrightarrow{\text{line4 } \times= (19)}
\begin{pmatrix} 1 & 0 & 0 & -\frac{33}{19} & -1 \\ 0 & 1 & 0 & -\frac{10}{19} & 0 \\ 0 & 0 & 1 & -\frac{33}{19} & 0 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}
$$

$$
\xrightarrow{\text{line1 } += \text{ line4}\times\left(\frac{33}{19}\right)}
\begin{pmatrix} 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & -\frac{10}{19} & 0 \\ 0 & 0 & 1 & -\frac{33}{19} & 0 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}
\xrightarrow{\text{line2 } += \text{ line4}\times\left(\frac{10}{19}\right)}
\begin{pmatrix} 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & -\frac{33}{19} & 0 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}
$$

$$
\xrightarrow{\text{line3 } += \text{ line4}\times\left(\frac{33}{19}\right)}
\begin{pmatrix} 1 & 0 & 0 & 0 & -1 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \end{pmatrix}
$$

$$\begin{pmatrix} 0 & -2 & 3 & 6 & -3 \\ -3 & -3 & -9 & 3 & 9 \\ 5 & 6 & 3 & -8 & -1 \\ -2 & -3 & 1 & 5 & -2 \end{pmatrix} \xrightarrow{\text{line1} \leftrightarrow \text{line2}} \begin{pmatrix} -3 & -3 & -9 & 3 & 9 \\ 0 & -2 & 3 & 6 & -3 \\ 5 & 6 & 3 & -8 & -1 \\ -2 & -3 & 1 & 5 & -2 \end{pmatrix} \xrightarrow{\text{line1} \times= \left(-\frac{1}{3}\right)} \begin{pmatrix} 1 & 1 & 3 & -1 & -3 \\ 0 & -2 & 3 & 6 & -3 \\ 5 & 6 & 3 & -8 & -1 \\ -2 & -3 & 1 & 5 & -2 \end{pmatrix}$$

$$\xrightarrow{\text{line3} -= \text{line1} \times (5)} \begin{pmatrix} 1 & 1 & 3 & -1 & -3 \\ 0 & -2 & 3 & 6 & -3 \\ 0 & 1 & -12 & -3 & 14 \\ -2 & -3 & 1 & 5 & -2 \end{pmatrix} \xrightarrow{\text{line4} += \text{line1} \times (2)} \begin{pmatrix} 1 & 1 & 3 & -1 & -3 \\ 0 & -2 & 3 & 6 & -3 \\ 0 & 1 & -12 & -3 & 14 \\ 0 & -1 & 7 & 3 & -8 \end{pmatrix}$$

$$\xrightarrow{\text{line2} \leftrightarrow \text{line3}} \begin{pmatrix} 1 & 1 & 3 & -1 & -3 \\ 0 & 1 & -12 & -3 & 14 \\ 0 & -2 & 3 & 6 & -3 \\ 0 & -1 & 7 & 3 & -8 \end{pmatrix} \xrightarrow{\text{line1} -= \text{line2}} \begin{pmatrix} 1 & 0 & 15 & 2 & -17 \\ 0 & 1 & -12 & -3 & 14 \\ 0 & -2 & 3 & 6 & -3 \\ 0 & -1 & 7 & 3 & -8 \end{pmatrix}$$

$$\xrightarrow{\text{line3} += \text{line2} \times (2)} \begin{pmatrix} 1 & 0 & 15 & 2 & -17 \\ 0 & 1 & -12 & -3 & 14 \\ 0 & 0 & -21 & 0 & 25 \\ 0 & -1 & 7 & 3 & -8 \end{pmatrix} \xrightarrow{\text{line4} += \text{line2}} \begin{pmatrix} 1 & 0 & 15 & 2 & -17 \\ 0 & 1 & -12 & -3 & 14 \\ 0 & 0 & -21 & 0 & 25 \\ 0 & 0 & -5 & 0 & 6 \end{pmatrix} \tag{100}$$

$$\xrightarrow{\text{line3} -= \text{line4} \times (4)} \begin{pmatrix} 1 & 0 & 15 & 2 & -17 \\ 0 & 1 & -12 & -3 & 14 \\ 0 & 0 & -1 & 0 & 1 \\ 0 & 0 & -5 & 0 & 6 \end{pmatrix} \xrightarrow{\text{line3} \times= (-1)} \begin{pmatrix} 1 & 0 & 15 & 2 & -17 \\ 0 & 1 & -12 & -3 & 14 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & -5 & 0 & 6 \end{pmatrix}$$

$$\xrightarrow{\text{line1} -= \text{line3} \times (15)} \begin{pmatrix} 1 & 0 & 0 & 2 & -2 \\ 0 & 1 & -12 & -3 & 14 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & -5 & 0 & 6 \end{pmatrix} \xrightarrow{\text{line2} += \text{line3} \times (12)} \begin{pmatrix} 1 & 0 & 0 & 2 & -2 \\ 0 & 1 & 0 & -3 & 2 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & -5 & 0 & 6 \end{pmatrix}$$

$$\xrightarrow{\text{line4} += \text{line3} \times (5)} \begin{pmatrix} 1 & 0 & 0 & 2 & -2 \\ 0 & 1 & 0 & -3 & 2 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line1} += \text{line4} \times (2)} \begin{pmatrix} 1 & 0 & 0 & 2 & 0 \\ 0 & 1 & 0 & -3 & 2 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$

$$\xrightarrow{\text{line2} -= \text{line4} \times (2)} \begin{pmatrix} 1 & 0 & 0 & 2 & 0 \\ 0 & 1 & 0 & -3 & 0 \\ 0 & 0 & 1 & 0 & -1 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix} \xrightarrow{\text{line3} += \text{line4}} \begin{pmatrix} 1 & 0 & 0 & 2 & 0 \\ 0 & 1 & 0 & -3 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{pmatrix}$$