406.0

1. Consider the system of 2x2 equations x + 2y = 5 and 3x - 5y = -7. Solve the system of equations using inverse of a matrix.

Answer:

$$x+2y=5$$
$$3x-5y=-7$$

$$\begin{pmatrix}1 & 2\\ 3 & -5\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}5\\ -7\end{pmatrix}$$

$R_1 \to 3R_1$

$R_2 \to 3R_1 - R_2$

$$\Rightarrow \begin{pmatrix}3 & 6\\ 0 & 11\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}15\\ 22\end{pmatrix}$$

$$\Rightarrow \begin{pmatrix}1 & 2\\ 0 & 11\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}5\\ 22\end{pmatrix}$$

$5 - \frac{2}{11} \times 22$

$R_1 \to R_1 - \frac{2}{11} \times R_2$

$$\begin{pmatrix}1 & 0\\ 0 & 11\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}1\\ 22\end{pmatrix}$$

$R_2 \to \frac{1}{11} R_2$

$$\begin{pmatrix}1 & 0\\ 0 & 11/11\end{pmatrix}\begin{pmatrix}x\\ y\end{pmatrix}=\begin{pmatrix}1\\ 2\end{pmatrix} \Rightarrow \boxed{\begin{matrix}x=1\\ y=2\end{matrix}}$$