Name_____

Advanced Algebra

Unit 6 Assignment #14

Solve the Matrix equations. You need to show how to find the inverse of the 2 by 2. You then know that when you multiply $[A]^{-1} * [A]$ you just get $\begin{bmatrix} x \\ y \end{bmatrix}$. You know what you do to one side you need to do to the other. So you must multiply $[A]^{-1}$ on the LEFT side of the answer matrix [B].

1) $\begin{bmatrix} 2 & 4 \\ 7 & -3 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 14 \\ 15 \end{bmatrix}$

Let $[A] = \begin{bmatrix} 2 & 4 \\ 7 & -3 \end{bmatrix}$ And $[B] = \begin{bmatrix} 14 \\ 15 \end{bmatrix}$ Then

$[A]^{-1}[A] \cdot \begin{bmatrix} x \\ y \end{bmatrix} = [A]^{-1}[B]$

$\begin{bmatrix} x \\ y \end{bmatrix} = [A]^{-1}[B]$

So now I need to find the Inverse of Matrix A so I know

$[A]^{-1} \cdot \begin{bmatrix} 2 & 4 \\ 7 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

Let $\begin{bmatrix} a & b \\ c & d \end{bmatrix} = [A]^{-1}$

$\begin{bmatrix} a & b \\ c & d \end{bmatrix} \cdot \begin{bmatrix} 2 & 4 \\ 7 & -3 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$2a + 7b = 1$
$4a - 3b = 0$

$4a + 14b = 2$
$-4a + 3b = 0$
$17b = 2$
$b = \frac{2}{17}$

$a = \frac{1.5}{17}$

$2c + 7d = 0$
$4c - 3d = 1$

$4c + 14d = 0$
$-4c + 3d = -1$
$17d = -1$
$d = \frac{-1}{17}$

$c = \frac{3.5}{17}$

So $\begin{bmatrix} \frac{1.5}{17} & \frac{2}{17} \\ \frac{3.5}{17} & \frac{-1}{17} \end{bmatrix}\begin{bmatrix} 14 \\ 15 \end{bmatrix} = \begin{bmatrix} 3 \\ 2 \end{bmatrix}$

2) $\begin{bmatrix} 2 & -3 \\ 1 & 1 \end{bmatrix}\begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -14 \\ 13 \end{bmatrix}$

I know that $\begin{bmatrix} x \\ y \end{bmatrix} = [A]^{-1}\begin{bmatrix} -14 \\ 13 \end{bmatrix}$

So $\begin{bmatrix} a & b \\ c & d \end{bmatrix}\begin{bmatrix} 2 & -3 \\ 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

$2a + b = 1$
$-3a + b = 0$
$5a = 1$
$a = \frac{1}{5}$

$b = \frac{3}{5}$

$2c + d = 0$
$-3c + d = 1$
$5c = -1$
$c = \frac{-1}{5}$

$d = \frac{2}{5}$

So $\begin{bmatrix} \frac{1}{5} & \frac{3}{5} \\ \frac{-1}{5} & \frac{2}{5} \end{bmatrix}\begin{bmatrix} -14 \\ 13 \end{bmatrix} = \begin{bmatrix} 5 \\ 8 \end{bmatrix}$

3) $\begin{bmatrix}1 & 2\\ 1 & -3\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}8\\ -17\end{bmatrix}$

Let $[A]=\begin{bmatrix}1 & 2\\ 1 & -3\end{bmatrix}$ $[B]=\begin{bmatrix}8\\ -17\end{bmatrix}$ Then

$[A]^{-1}\cdot[A]\begin{bmatrix}x\\ y\end{bmatrix}=[A]^{-1}[B]$

$\begin{bmatrix}x\\ y\end{bmatrix}=[A]^{-1}[B]$

$\begin{bmatrix}\frac{3}{5} & \frac{2}{5}\\ -\frac{1}{5} & \frac{1}{5}\end{bmatrix}\begin{bmatrix}8\\ -17\end{bmatrix}=\begin{bmatrix}-2\\ -5\end{bmatrix}$

How to find Inverse

$\begin{bmatrix}a & b\\ c & d\end{bmatrix}\begin{bmatrix}1 & 2\\ 1 & -3\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

$a+b=1$ $\quad c+d=0$ (-2)

$2a-3b=0$ $\quad 2c-3d=1$

$-2a-2b=-2$ $\quad -2c-2d=0$

$2a-3b=0$ $\quad 2c-3d=1$

$-5b=-2$ $\quad -5d=1$

$b=\frac{2}{5}$ $\quad d=\frac{1}{5}$

$a=\frac{3}{5}$ $\quad c=-\frac{1}{5}$

4) $\begin{bmatrix}6 & 4\\ 1 & -1\end{bmatrix}\begin{bmatrix}x\\ y\end{bmatrix}=\begin{bmatrix}44\\ 4\end{bmatrix}$

Let $[A]=\begin{bmatrix}6 & 4\\ 1 & -1\end{bmatrix}$ $[B]=\begin{bmatrix}44\\ 4\end{bmatrix}$

Then

$[A]^{-1}[A]\begin{bmatrix}x\\ y\end{bmatrix}=[A]^{-1}[B]$

$\begin{bmatrix}x\\ y\end{bmatrix}=[A]^{-1}[B]$

$\begin{bmatrix}\frac{1}{10} & \frac{4}{10}\\ \frac{1}{10} & -\frac{6}{10}\end{bmatrix}\cdot\begin{bmatrix}44\\ 4\end{bmatrix}=\begin{bmatrix}6\\ 2\end{bmatrix}$

How to find Inverse

$\begin{bmatrix}a & b\\ c & d\end{bmatrix}\begin{bmatrix}6 & 4\\ 1 & -1\end{bmatrix}=\begin{bmatrix}1 & 0\\ 0 & 1\end{bmatrix}$

$6a+b=1$ $\quad 6c+d=0$

$4a-b=0$ $\quad 4c-d=1$

$10a=1$ $\quad 10c=1$

$a=\frac{1}{10}$ $\quad c=\frac{1}{10}$

$b=\frac{4}{10}$ $\quad d=-\frac{6}{10}$