Algebra RH

Essential Question:: How do we solve Systems of Linear Equations using matrices?

Do Now: Solve the following system of linear equations algebraically :

$-1(x - y = -1)$

$x + 2y = 5$

$-x + y = 1$

$3y = 6$

$y = 2$

$x - y = -1$

$x - 2 = -1$

$x = 1$ ✓

We can solve the system in #2 above using matrices on the graphing calculator.

Generally, a matrix (m by n) is an arrangement of terms consisting of m lines and n columns. The equations MUST BE in STANDARD FORM!!!

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$$\begin{bmatrix} a_{11} & a_{12} & a_{13} & a_{14} \\ a_{21} & a_{22} & a_{23} & a_{24} \\ a_{31} & a_{32} & a_{33} & a_{34} \end{bmatrix}$$

3 × 4 matrix

Solve the following system of linear equations: $x - y = -1$ 2 Rows

$x + 2y = 5$ 3 columns

1. Set up matrix A, containing the ***coefficients*** and the ***constants***:

$$A: \begin{bmatrix} x & y & \\ 1 & -1 & -1 \\ 1 & 2 & 5 \end{bmatrix}$$

2. Enter the information for matrix A into the calculator.
   - [2ND] [x^{-1}] → EDIT → 1
   - 2 → enter
   - 3 → enter
   - 1 → enter
   - -1 → enter
   - -1 → enter
   - 1 → enter
   - 2 → enter
   - 5 → enter
   - [2ND] MODE

3. Calculate.
   - [2ND] [x^{-1}] → MATH → B: rref → enter
   - [2ND] [x^{-1}] → 1 → enter

4. The solution should appear as:

   [[1 0 1]
   [0 1 2]]

   This means that $1x + 0 = 1$, or $x = 1$ and $0 + 1y = 2$, or $y = 2$. Therefore, the solution is **(1, 2)**.

Practice To use a Matrix, put in Standard form $ax+by=c$

Solve each system of linear equations both algebraically using either substitution or elimination, and using matrices on the graphing calculator. Show the matrices entered into the calculator.

System	Algebraic Solution	Matrix Solution
1. $x+y=4$ $x-y=6$	$2x=10$ $\boxed{x=5}$ $5+y=4$ $\boxed{y=-1}$	$\begin{bmatrix}1&1&4\\1&-1&6\end{bmatrix}$ $=\begin{bmatrix}1&0&5\\0&1&-1\end{bmatrix}$ ✓ $\boxed{x=5 \quad y=-1}$
2. $2x-y-5=0$ $x=6+y$ ↓ $2x-y=5$ $x-y=6$	$2(6+y)-y-5=0$ $12+2y-y-5=0$ $7+y=0$ $\boxed{y=-7}$ $x=6+(-7)$ $\boxed{x=-1}$	$\begin{bmatrix}2&-1&5\\1&-1&6\end{bmatrix}$ $=\begin{bmatrix}1&0&-1\\0&1&-7\end{bmatrix}$ ✓ $\boxed{x=-1 \quad y=-7}$
3. $2y+4x=8$ $x+y=4$ $4x+2y=8$ $x+y=4$	$4x+2y=8$ $-4(x+y=4)$ $-4x-4y=-16$ $-2y=-8$ $\boxed{y=4}$ $x+4=4$ $\boxed{x=0}$	$\begin{bmatrix}4&2&8\\1&1&4\end{bmatrix}$ $=\begin{bmatrix}1&0&0\\0&1&4\end{bmatrix}$ ✓ $\boxed{x=0 \quad y=4}$
4. $5x+4y=-10$ $3x+6y=-6$	$-3[5x+4y=-10]$ $5[3x+6y=-6]$ $-15x-12y=30$ $15x+30y=-30$ $18y=0$ $\boxed{y=0}$ $5x+4(0)=-10$ $5x=-10$ $\boxed{x=-2}$	$\begin{bmatrix}5&4&-10\\3&6&-6\end{bmatrix}$ $=\begin{bmatrix}1&0&-2\\0&1&0\end{bmatrix}$ ✓ $\boxed{x=-2 \quad y=0}$