Calvin Lo

Assignment #2 pg 10, 1-10 odd

Solve each system in Exercises 1-4 by using elementary row operations on the equations or on the augmented matrix. Follow the systematic elimination procedure described in this section.

#1 $x_1 + 5x_2 = 7$ $\begin{bmatrix} 1 & 5 & 7 \\ -2 & -7 & -5 \end{bmatrix}$

$-2x_1 - 7x_2 = -5$

$2(Row_1) + Row_2 = New\ Row_2$

$$\begin{bmatrix} 1 & 5 & 7 \\ 2*1+(-2) & 2*5+(-7) & 2*7+(-5) \end{bmatrix} = \begin{bmatrix} 1 & 5 & 7 \\ 0 & 3 & 9 \end{bmatrix}$$

Multiply new row 2 by 1/3 to get the coefficient 1 for x_2: $\begin{bmatrix} 1 & 5 & 7 \\ 0 & 1 & 3 \end{bmatrix}$

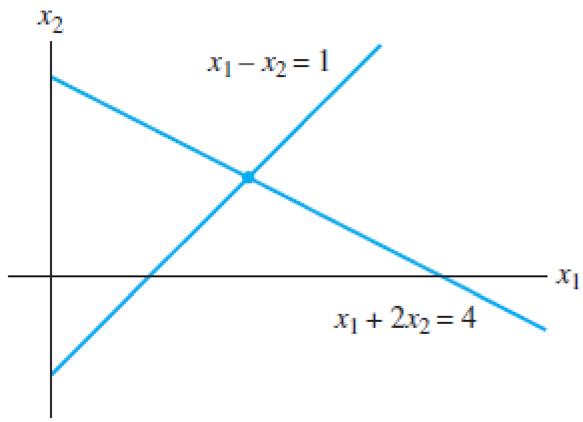
$-5(Row_2) + Row_1 = New\ Row_1$

$$\begin{bmatrix} -5*0+1 & -5*1+5 & -5*3+7 \\ 0 & 1 & 3 \end{bmatrix} = \begin{bmatrix} 1 & 0 & -8 \\ 0 & 1 & 3 \end{bmatrix}$$

Answer: $x_1 = 3$, $x_2 = -8$

#3

Find the point (x_1, x_2) that lies on the line $x_1 + 2x_2 = 4$ and on the line $x_1 - x_2 = 1$. See the figure.



$x_1 - x_2 = 1$

$x_1 + 2x_2 = 4$ $\begin{bmatrix} 1 & -1 & 1 \\ 1 & 2 & 4 \end{bmatrix}$

$-1(\text{Row}_1) + \text{Row}_2 = \text{New Row}_2$

$$\begin{bmatrix} 1 & -1 & 1 \\ -1(1) + 1 & -1(-1) + 2 & -1(1) + 4 \end{bmatrix} = \begin{bmatrix} 1 & -1 & 1 \\ 0 & 3 & 3 \end{bmatrix}$$

Multiply row 2 by 1/3 to get the coefficient of x_2 to 1

$$\begin{bmatrix} 1 & -1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$$

$1(\text{Row}_2) + \text{Row}_1 = \text{New Row}_1$

$$\begin{bmatrix} 1(0) + 1 & 1(1) + -1 & 1(1) + 1 \\ 0 & 1 & 1 \end{bmatrix} = \begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 1 \end{bmatrix}$$

Answer: $x_1 = 2$, $x_2 = 1$

5

Consider each matrix in Exercises 5 and 6 as the augmented matrix of a linear system. State in words the next two elementary row operations that should be performed in the process of solving the system.

5. $$\begin{bmatrix} 1 & -4 & -3 & 0 & 7 \\ 0 & 1 & 4 & 0 & 6 \\ 0 & 0 & 1 & 0 & 2 \\ 0 & 0 & 0 & 1 & -5 \end{bmatrix}$$

Answer: Multiply Row 3 by (-4) and replace row 2 with that. Then multiply Row 3 by (3 and replace Row 1 with that.

#7

In Exercises 7–10, the augmented matrix of a linear system has been reduced by row operations to the form shown. In each case, continue the appropriate row operations and describe the solution set of the original system.

$$\begin{bmatrix} 1 & 7 & 3 & -4 \\ 0 & 1 & -1 & 3 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 1 & -2 \end{bmatrix}$$

Answer: The solution set is empty.

#9

9. $$\begin{bmatrix} 1 & -1 & 0 & 0 & -5 \\ 0 & 1 & -2 & 0 & -7 \\ 0 & 0 & 1 & -3 & 2 \\ 0 & 0 & 0 & 1 & 4 \end{bmatrix}$$