Do Now: #s 4 and 5 from last night's homework sheet

4. $x-2y-3z=2$
   $x-4y+3z=14$
   $-3x+5y+4z=0$

$$\left[\begin{array}{ccc|c} 1 & -2 & -3 & 2 \\ 1 & -4 & 3 & 14 \\ -3 & 5 & 4 & 0 \end{array}\right] \begin{array}{l} \\ -R_1+R_2 \\ \\ \end{array} \left[\begin{array}{ccc|c} 1 & -2 & -3 & 2 \\ 0 & -2 & 6 & 12 \\ -3 & 5 & 4 & 0 \end{array}\right]$$

$$-1\ 2\ 3\ -2$$
$$1\ -4\ 3\ 14$$

$$-\tfrac{1}{2}R_2 \left[\begin{array}{ccc|c} 1 & -2 & -3 & 2 \\ 0 & 1 & -3 & -6 \\ -3 & 5 & 4 & 0 \end{array}\right] \begin{array}{l} \\ 3R_1+R_3 \\ \\ \end{array} \left[\begin{array}{ccc|c} 1 & -2 & -3 & 2 \\ 0 & 1 & -3 & -6 \\ 0 & -1 & -5 & 6 \end{array}\right]$$

$$3\ -6\ -9\ 6$$
$$-3\ 5\ 4\ 0$$

$$R_2+R_3 \left[\begin{array}{ccc|c} 1 & -2 & -3 & 2 \\ 0 & 1 & -3 & -6 \\ 0 & 0 & -8 & 0 \end{array}\right] \quad -\tfrac{1}{8}R_3 \left[\begin{array}{ccc|c} 1 & -2 & -3 & 2 \\ 0 & 1 & -3 & -6 \\ 0 & 0 & 1 & 0 \end{array}\right]$$

$z = 0$

$y-3z=-6$
$y-3(0)=-6$
$y=-6$

$x-2y-3z=2$
$x-2(-6)-3(0)=2$
$x+12=2$
$x=-10$

$(-10,-6,0)$

5. $x \quad -3z = -2$
$3x + y - 2z = 5$
$2x + 2y + z = 4$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 3 & 1 & -2 & 5 \\ 2 & 2 & 1 & 4 \end{array}\right] \quad -3R_1 + R_2 \quad \begin{array}{cccc} -3 & 0 & 9 & 6 \\ 3 & 1 & -2 & 5 \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 2 & 2 & 1 & 4 \end{array}\right]$$

$$-2R_1 + R_3 \quad \begin{array}{cccc} -2 & 0 & 6 & 4 \\ 2 & 2 & 1 & 4 \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 2 & 7 & 8 \end{array}\right] \quad -2R_2 + R_3 \quad \begin{array}{cccc} 0 & -2 & -14 & -22 \\ 0 & 2 & 7 & 8 \end{array}$$

$$\left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 0 & -7 & -14 \end{array}\right]$$

$$-\frac{1}{7}R_3 \quad \left[\begin{array}{ccc|c} 1 & 0 & -3 & -2 \\ 0 & 1 & 7 & 11 \\ 0 & 0 & 1 & 2 \end{array}\right]$$

$z = 2$

$y + 7z = 11$

$y + 7(2) = 11$

$y + 14 = 11$

$y = -3$

$x - 3z = -2$

$x - 3(2) = -2$

$x - 6 = -2$

$x = 4$

$(4, -3, 2)$

From today's sheet:

Name: _____ Date:_____

PC: Practice Using Matrices to Solve Linear Systems Ms. Loughran

Solve each of the following using matrices.

Goal: $\begin{bmatrix} 1 & & \\ 0 & 1 & \\ 0 & 0 & 1 \end{bmatrix}$

1. $\begin{aligned} x+2y-z&=1 \\ 2x-y+3z&=4 \\ 5x\quad\ \ +5z&=9 \end{aligned}$

$\left[\begin{array}{ccc|c} 1 & 2 & -1 & 1 \\ 2 & -1 & 3 & 4 \\ 5 & 0 & 5 & 9 \end{array}\right]$ $-2R_1+R_2$, $-2R_1\ [-2\ \ -4\ \ 2\ \ -2]$ $\left[\begin{array}{ccc|c} 1 & 2 & -1 & 1 \\ 0 & -5 & 5 & 2 \\ 5 & 0 & 5 & 9 \end{array}\right]$

$-5R_1+R_3$

$-5R_1\ [-5\ \ -10\ \ 5\ \ -5]$ $\left[\begin{array}{ccc|c} 1 & 2 & -1 & 1 \\ 0 & -5 & 5 & 2 \\ 0 & -10 & 10 & 4 \end{array}\right]$

$-2R_2+R_3$ infinitely many

$-2R_2$

$[0\ \ 10\ \ -10\ \ -4]$ $\left[\begin{array}{ccc|c} 1 & 2 & -1 & 1 \\ 0 & -5 & 5 & 2 \\ 0 & 0 & 0 & 0 \end{array}\right]$

3. $x+y+z=4$
$x-2y-z=1$
$2x-y-2z=-1$

Goal: $\begin{bmatrix} 1 & & \\ & 1 & \\ & & 1 \end{bmatrix}$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 4 \\ 1 & -2 & -1 & 1 \\ 2 & -1 & -2 & -1 \end{array}\right] \quad -R_1+R_2 \quad -R_1[-1\ -1\ -1\ -4]$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 4 \\ 0 & -3 & -2 & -3 \\ 2 & -1 & -2 & -1 \end{array}\right]$$

$-2R_1+R_3$

$-2R_1[-2\ -2\ -2\ -8]$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 4 \\ 0 & -3 & -2 & -3 \\ 0 & -3 & -4 & -9 \end{array}\right]$$

$-R_2+R_3$

$-R_2[0\ 3\ 2\ 3]$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 4 \\ 0 & -3 & -2 & -3 \\ 0 & 0 & -2 & -6 \end{array}\right] \quad -\frac{1}{2}R_3$$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 4 \\ 0 & -3 & -2 & -3 \\ 0 & 0 & 1 & 3 \end{array}\right]$$

$-\frac{1}{3}R_2$

$$\left[\begin{array}{ccc|c} 1 & 1 & 1 & 4 \\ 0 & 1 & \frac{2}{3} & 1 \\ 0 & 0 & 1 & 3 \end{array}\right]$$

$z=3$

$y+\frac{2}{3}z=1$

$y+\frac{2}{3}(3)=1$

$y+2=1$

$y=-1$

$x+y+z=-1$

$x-1+3=4$

$x+2=4$

$x=2$

$(2,-1,3)$

$x + y + z = 4$

3. $x - 2y - z = 1$

   $2x - y - 2z = -1$

$2x - y - 3z = -1$

5. $2x - y + z = -9$

$x + 2y - 4z = 17$

Homework 02-08

① $(-1, 2, -3)$

② $(7, 1, -2)$

③ $(-2, 1, 3)$