

1. (15 pts) Is $(x, y) = (3, -7)$ a solution of the system, below?

$$3x - 2y = 23$$

$$2x - y = 13$$

$$3(3) - 2(-7) = 23$$

$$9 + 14 = 23 \quad \checkmark$$

$$2(3) - (-7) = 13$$

$$6 + 7 = 13 \quad \checkmark$$

2. (15 pts) Solve the following system of linear equations by graphing. (Hint: Using the slope and the y -intercept to graph worked really well when I did this one.)

$$x - y = -5$$

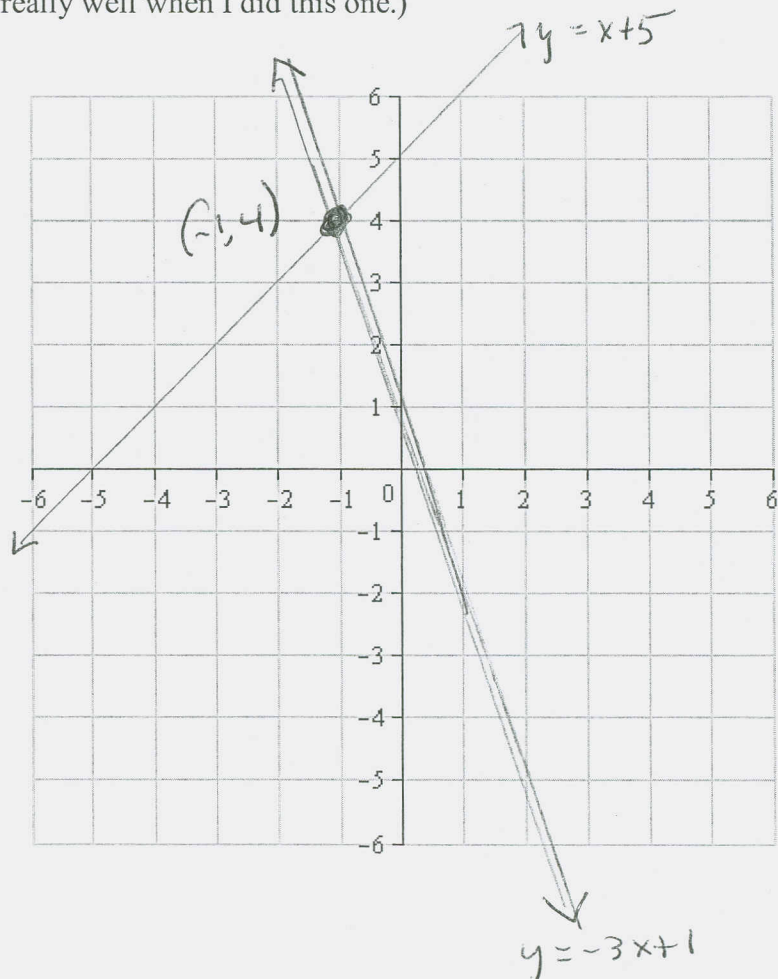
$$3x + y = 1$$

$$-y = -x - 5$$

$$y = x + 5$$

$$y = -3x + 1$$

$$(x, y) = (-1, 4)$$



3. (15 pts) Solve the following system of linear equations by the substitution method:

$$x - y = -5$$

$$3x + y = 1$$

$$y = -3x + 1$$

$$y = -3(-1) + 1$$

$$x - (-3x + 1) = -5$$

$$y = 4$$

$$x + 3x - 1 = -5$$

$$(x, y) = (-1, 4)$$

$$4x = -4$$

$$x = -1$$

4. (15 pts) A Chemist has an unlimited supply of both 25% and 44% nitric acid solutions. He wants 100 liters of 30% nitric acid. How much of the 25% and 44% solutions should he mix together to accomplish this?

$$x + y = 100$$

$$y = -x + 100$$

$$.25x + .44y = .3(100)$$

$$.25x + .44(-x + 100) = 30$$

$$.25x - .44x + 44 = 30$$

$$-.19x = -14$$

$$x = \frac{14}{.19} \approx 73.68421053$$

$$y \approx -73.68421053 + 100$$

$$= 26.31578947$$

$$(x, y) \approx (73.7, 26.3)$$

$x = \#$ of liters of 25% Nitric.

$y =$ " " " " 44% "

5. (15 pts) Solve the following system of linear equations by the addition method.

$$x - y = -5$$

$$3x + y = 1$$

$$4x = -4$$

$$x = -1$$

$$(x, y) = (-1, 4)$$

$$-1 - y = -5$$

$$-y = -4$$

$$y = 4$$

6. (5 pts) **Recognition:** Write the recipe that was used to achieve the 2nd matrix from the first.

Interpretation: Write the system of linear equations corresponding to the 2nd matrix.

$$\left[\begin{array}{ccc|c} 1 & -3 & 2 & 21 \\ -2 & 7 & -3 & -40 \\ 3 & -9 & 7 & 68 \end{array} \right] \begin{array}{l} R1 \\ 2R1 + R2 \\ -3R1 + R3 \end{array} \left[\begin{array}{ccc|c} 1 & -3 & 2 & 21 \\ 0 & 1 & 1 & 2 \\ 0 & 0 & 1 & 5 \end{array} \right] \begin{array}{l} x - 3y + 2z = 21 \\ y + z = 2 \\ z = 5 \end{array}$$

7. (5 pts) **Decision-Making:** Tell me what recipe *you* would apply to get to the next matrix:

$$\left[\begin{array}{ccc|c} 1 & -2 & -1 & 6 \\ 0 & 1 & 2 & 3 \\ 0 & 1 & -1 & 1 \end{array} \right] \begin{array}{l} 2R2 + R1 \\ R2 \\ -R2 + R3 \end{array}$$

8. (5 pts bonus) **Do-it-yourself:** Find the next logical matrix in the row-reduction, with your own recipe and your own work. What is the solution of this system?

$$\left[\begin{array}{ccc|c} 1 & 0 & 4 & 27 \\ 0 & 1 & -1 & 2 \\ 0 & 0 & 1 & 5 \end{array} \right] \begin{array}{l} -4R3 + R1 \\ R3 + R2 \\ R3 \end{array} \left[\begin{array}{ccc|c} 1 & 0 & 0 & 7 \\ 0 & 1 & 0 & 7 \\ 0 & 0 & 1 & 5 \end{array} \right]$$

$$(x, y, z) = (7, 7, 5)$$

9. (15 pts) For the following problem, I'm *only* looking for the **setup**. That means:

- Define the variables in words and give the units.
- Write the system of linear equations corresponding to the problem situation.
- Write the matrix that represents the system you constructed.

A dietician is trying to put together her own brand of trail mix, by mixing three brands (Brand X, Brand Y, and Brand Z) of trail mix, so that *hers* will have 21 grams of fat, 50 grams of carbohydrate and 68 grams of protein per serving. The three brands of trail mix supply these according to the following table, that gives the number of grams of fat, carbs and protein per unit of each brand.

	Fat (grams)	Carbs (grams)	Protein (grams)
Brand X	1	2	3
Brand Y	3	7	9
Brand Z	2	5	7

How many units of each brand of trail mix should she use to make *her* brand of trail mix?
Remember: Setup only. Don't try to solve the system, after you've built it.

$$\left[\begin{array}{ccc|c} 1 & 3 & 2 & 21 \\ 2 & 7 & 5 & 50 \\ 3 & 9 & 7 & 68 \end{array} \right]$$

$$x + 3y + 2z = 21 \quad \text{FAT GRAMS}$$

$$2x + 7y + 5z = 50 \quad \text{Carb GRAMS}$$

$$3x + 9y + 7z = 68 \quad \text{PROTEIN GRAMS}$$

$x =$ # of units of Brand X

$y =$ " " " " " }
" " " " " }

$z =$ " " " " " }