Name: 2/17/20

## HansenMath<sup>™</sup> Pre-calc: 7.2 Systems of Linear Equations in Two Variables

Story: Mr. Hansen has opened (hypothetically, of course) a food truck. He is selling Ribeye steaks for \$20 each and his special-recipe Black-Bean-Hummus bowls (I love my vegan students, too) for \$8. If Mr. Hansen collects \$580 from selling 38 entrees after his first weekend of sales, how many of each entree did he sell? How do you solve this?? Systems of equations are invaluable for solving this and similar problems!

Example 1 (opposite # coefficients): Solve the system of linear equations:

$$3x + 2y = 4$$

$$5x - 2y = 8$$

8x = 12 8

3x + 2y = 4 3(1.5) + 2y = 4 4.5 + 2y = 4-4.5

Example 2 (non-opposite # coefficients): 27 = Solve the system of linear equations:

$$5x + 3y = 9$$

$$2x - 4y = 14$$

 $20 \times + 12y = 36$  $6 \times - 12y = 42$ 

$$26 \times = 78$$

$$x = 3$$

Then: S(3) + 3y = 915 + 3y = 9 4(3)

## The Method of Elimination

to use the method of elimination to solve a system of two linear equations in x and y, perform the following steps.

- Obtain coefficients for x (or y) that differ only in sign by multiplying all terms of one or both equations by suitably chosen constants.
- Add the equations to eliminate one variable; solve the resulting equation.
- 3. Back-substitute the value obtained in Step 2 into either of the original equations and solve for the other variable.
- 4. Check your solution in both of the original equations.

$$y = -.25$$

$$* (1.5 -.25)$$

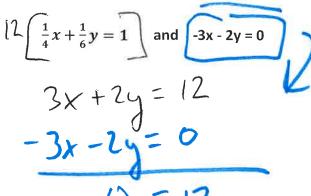
Example 3 (fraction style):

Solve the system of linear equations:

$$x - 2y = 5$$
 and  $x - 2y = 5$ 

$$3(x-1)+2(y+2)=24$$
  
 $3x-3+2y+4=24$   
 $3x+2y=231$ 

Example 4 (no solution / inconsistent / parallel):



No Solution (Parallel

Example 6 (Using your graphing calculator to solve)

$$2x + y = 5 \text{ and } x - 2y = -1$$

$$-2x - 2x \times x - x$$

$$y = -2x + 5 - 2y = -x - 1$$

$$-2x - 2x \times x - x$$

$$y = -2x + 5 - 2y = -x - 1$$

$$-2x - 2x \times x - x$$

An airplane flying into a headwind travels the 2000-mile flying distance between Cleveland, Ohio and Fresno, California in 4 hours and 24 minutes. On the return flight, the same distance is traveled in 4 hours. Find the airspeed of the plane and the speed of the wind, assuming that both remain constant.

Example 5 (Infinitely many solutions / same line):

$$-2 \begin{bmatrix} 2x-y=1 \\ 4x-2y=2 \end{bmatrix} - 4x + 2y = -2$$

$$4x-2y=2 \longrightarrow 4x - 2y = 2$$

$$0 = 0$$

**Graphical Interpretation of Solutions** 

For a system of two linear equations in two variables, the number of solutions is one of the following.

Number of Solutions

Graphical Interpretation

1. Exactly one solution

The two lines intersect at one point.

2. Infinitely many solutions The two lines are coincident (identical).

3. No solution

The two lines are parallel.

Assignment: Page 491, #7-15odd, 25, 27, 41-45odd, 55, 61, 71, 74 Thank you