Solving by Substitution

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

2. $8x + 7y = -21$
   $y = -2x - 3$

3. $y = 2x - 1$
   $7x + 3y = -3$

4. $y = -8$
   $5x + 2y = -21$

5. $y = -2x$
   $-2x - 7y = 0$

No solution, Many Solutions, Many Solutions, (3,2), (0,-3), (-1,-8), (0-1), (0,0), (-1,-6), (-2,-5)

Day 2 – Solving Systems Using Elimination

Another method for solving systems of equations when one of the variables is not isolated by a variable is to use **elimination.** Elimination involves adding or multiplying one or both equations until one of the variables can be eliminated by adding the two equations together. Elimination is also called linear combinations.

Take a look at the following systems of equations. Add the equations together and try to solve the system– what do you notice?

a.

$3x + 2y = 7$

$-3x + 4y = 5$

b.

$2x - 3y = 4$

$-4x + 5y = -8$

Steps for Solving Systems by Elimination

Step 1: Arrange the equations with like terms in columns.
Step 2: Multiply the top equation by the leading coefficient of the bottom equation and multiply the bottom equation by the leading coefficient of the top equation. You may need to make one of them negative as well – you want to end up with opposite coefficients
Step 3: Add the equations and solve for the remaining variable.
Step 4: Substitute the value into either equation and solve.

Elimination by Adding the Systems Together

Ex 1. $-2x + y = -7$

$2x - 2y = 8$

Ex 2. $4x - 2y = 2$

$3x + 2y = 12$

Solution:

Solution:

Elimination by Multiplying the Equations and Then Adding the Equations Together

Ex 5. $x + 12y = -15$

$-2x - 6y = -6$

Solution:

Ex 6. $6x + 8y = 12$

$2x - 5y = -19$

Solution:

Ex 7. $5x + y = 9$

$10x - 7y = -18$

Solution:

Ex 8. $7x + 2y = 24$

$8x + 2y = 30$

Solution:

Ex 9. $x - y = 2$

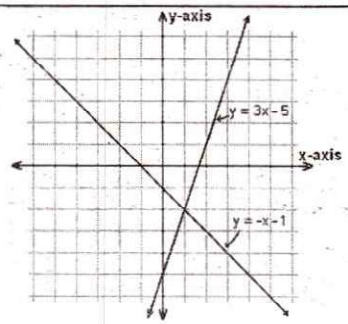
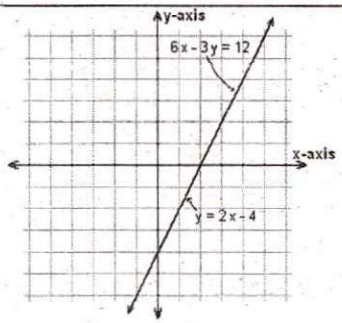
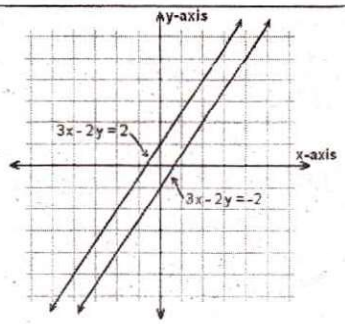
$2x - 2y = 4$

Ex 10. $x + y = 1$

$3x + 3y = 3$

Solution:

Solution:

		Number of Solutions		
		1 Solution	Infinitely Many Solutions (Infinite Solutions)	No Solution
Solving Methods	Graphing	 When graphed, the 2 lines **intersect once.**	 When graphed, the 2 lines **lie on top of one another.**	 When graphed, the 2 lines are strictly **parallel.**
	Substitution Elimination	When using either substitution or elimination, you should get a value for either x or y. You should be able to find the other value by substituting either x or y back into the original equation.	When using either substitution or elimination, you will get an equation that has **no variable** and is **always true**. For example: 2=2 or -5=-5	When using either substitution or elimination, you will get an equation that has **no variable** and is **never true**. For example: 0=6 or -2=4