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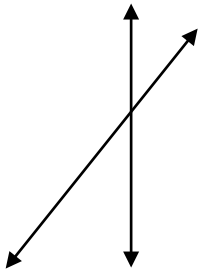
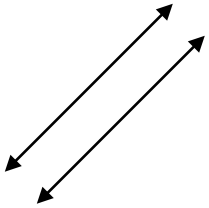
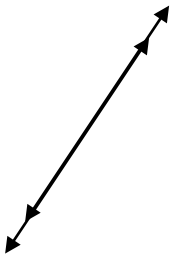
Math 31 **Activity # 8**

"Solving a System of Linear Equations"

Your Name: _____

System of linear equations in two variables can be solved by graphing method or algebraic methods which are _____or _____method.

	Possible outcomes when solving system of linear equations		
Number of Solutions	One solution	No Solution	Infinitely many solutions
Graphing Method	 The solution is the common point (x, y).	 (Parallel lines) There is no common point	 (Lines are identical, or coincide) There are infinite numbers of common points.
Substitution Method	The solution (x, y) exists.	Results in a false statement such as; $0 = 5$ or $4 = -4$, etc.	Results in a true statement such as $3 = 3$; or $-6 = -6$, etc.
Addition Method	The solution (x, y) exists.	Results in a false statement such as; $0 = 5$ or $4 = -4$, etc.	Results in a true statement such as $3 = 3$; $-6 = -6$ or $0 = 0$, etc.
Solution set	Express the solution using an ordered pair: $\{(\ ,\ )\}$	Express the solution as either No solution, Ø or $\{\ \}$	Use a solution set to show that the solution is composed of the points on the same line. $\{(x, y) \mid$ _____ $\}$ Use either of the original equation in the solution set.

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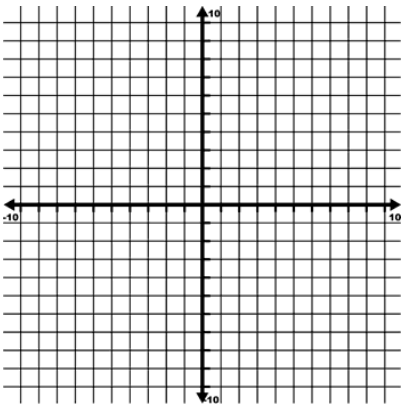
Solve each of the system of equations using all three methods: graphing by hand, substitution, and addition methods.

1) $3x + 2y = 8$
$2x - y = 3$

Graphing method



Addition method:

Substitution method

Which one(s) of the three methods do you prefer for the system? Explain.

Is the solution the same for all the methods? Explain why?

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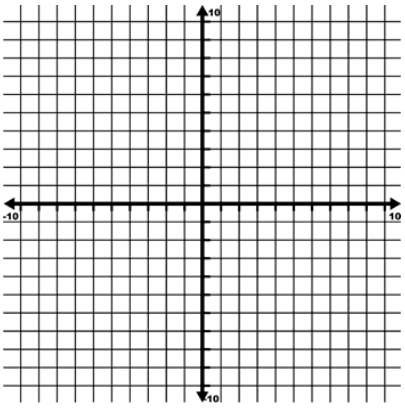
2) Solve the system. $y = 2x$

$2x - y = -2$

Graphing method



Addition method:

Substitution method

Which one(s) of the three methods do you prefer for the system? Explain.

Is the solution the same for all the methods? Explain why?

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Method	Advantage	Disadvantage
Graphing	You can see the solution(s).	Could be difficult to determine solutions from the graphs that are fractions, or decimals or too large to be seen on the graph. The solutions can be imprecise.
Substitution	Better than graphing method when the solution involve fractions or decimals. It does not require guessing; it gives the exact solutions.	Solutions can not been seen. Could be long when there is no variable that has coefficient of 1 or -1 in either equation.
Addition	Better than graphing when the solution involve fractions or decimals. It does not require guessing; it gives the exact solutions. Better than substitution when no coefficients are 1 or -1	Solutions can not be seen.

Determine the most efficient method for solving each of the following linear system of equations. **Do not solve!**

3) $4x-12y=-8$ $9x-11y=46$	**4)** $4x-3y=11$ $y=2x-13$

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5) $y=\frac{2}{3}x+8$ $y=\frac{3}{4}x+\frac{37}{4}$	**6)** $7x+15y=12$ $x+9y=4$
7) $5(2x+3y)=45$ $6x=18y$	**8)** $\frac{x}{4}+\frac{y}{8}=3$ $\frac{x}{5}-\frac{7}{4}=8$ **(Hint: First clear the factions of each equation by multiply both sides of the equation by the LCD, then, determine the most efficient method).**

Solve each of the following system by the method of your choice. Explain why you selected one method over the other two. If there is no solution or an infinite number of solutions, so sate. Use set notation to express solutions sets. Explain why graphing is the best method in one of the following problems.

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9) $\begin{cases} 4x+3y=3 \\ x+3y=1 \end{cases}$	**10)** $\begin{cases} -2x+7y=-3 \\ x=3y+2 \end{cases}$
11) $\begin{cases} 8x+5y=7 \\ 7y=-6x+15 \end{cases}$	**12)** $\begin{cases} 2x-3y=5 \\ 4x-6y=3 \end{cases}$
13) $\begin{cases} 2x+6y=6 \\ y=-\frac{1}{3}x+1 \end{cases}$	**14)** $\begin{cases} y=-2x-3 \\ y=3x+7 \end{cases}$

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Answers:

1) $\{(2,1)\}$	**2)** $\varnothing$	**9)** $\left\{\left(\frac{2}{3},\frac{1}{9}\right)\right\}$
10) $\{(5,1)\}$	**11)** $\{(-1,3)\}$	**12)** $\varnothing$
13) Infinite number of solutions. $\{(x,y)\|2x+6y=6\}$ or $\left\{(x,y)\middle\|y=-\frac{1}{3}+1\right\}$	**14)** $\{(-2,1)\}$	