

# 1.2 – Systems of Equations & Inequalities Review

– System of Equations → two or more equations that are GROUPED together.

▪ There are TWO ways to solve a system of equations:

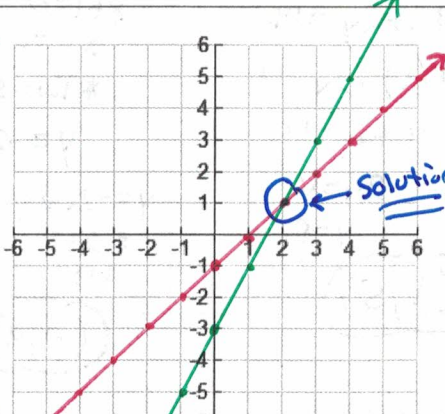
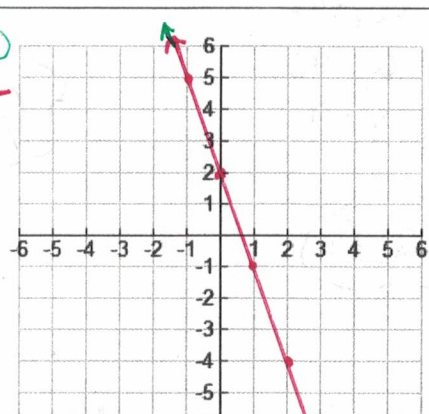
- 1.) Visually → Graphing <sup>Hand</sup> Calculator 2.) Algebraically → Substitution and Elimination

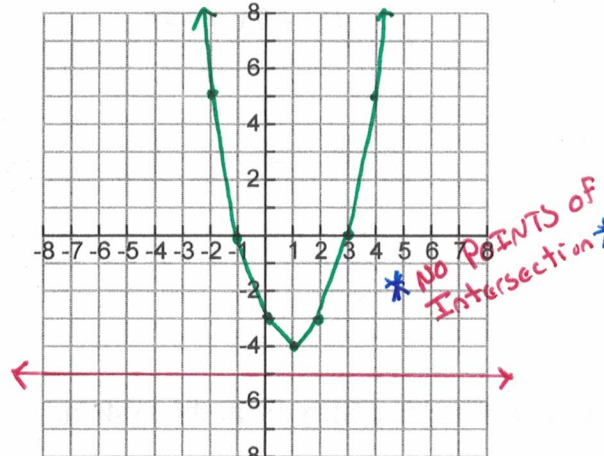
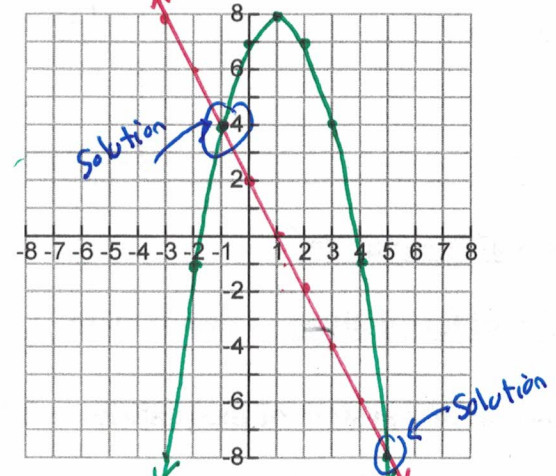
▪ Solutions of Systems of Equations:

- a.) By Graphing (method) → Common Point(s) in table or Point(s) of intersection on their graphs.
- b.) By Substitution/Elimination (methods) → Ordered Pair(s)  $(x, y)$  that makes all equations true.

## Solving Systems By Graphing

Example 1: Solve each system by graphing. \* ALL eqns MUST be in  $y =$  form. Solve for y.

<p>a.) <math>\begin{cases} y = 2x - 3 \\ y = x - 1 \end{cases}</math></p>  <p>Solution: <math>(2, 1)</math></p>	<p>b.) <math>\begin{cases} 6x + 2y = 4 \\ y = -3x + 2 \end{cases}</math></p> <p><math>6x + 2y = 4</math>  <math>-6x \quad -6x</math>  <math>\frac{2y}{2} = \frac{-6x + 4}{2}</math>  <math>y = -3x + 2</math></p>  <p>Solution: <u>Infinitely Many Solutions</u> → <u>All Real #'s</u> <math>\mathbb{R}</math></p>
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<p>e.) <math>\begin{cases} y = x^2 - 2x - 3 \\ y = -5 \end{cases}</math></p> <p>* Put into <math>y =</math> in the calculator, use the "table" to graph.          * <u>Horizontal Line</u></p>  <p>Solution: <math>\emptyset</math> NO Solution</p>	<p>f.) <math>\begin{cases} y = -x^2 + 2x + 7 \\ y = -2x + 2 \end{cases}</math></p> <p>* Put into calculator and graph! x</p>  <p>Solution: <math>(-1, 4)</math> <math>(5, -8)</math></p>
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# Solving Systems of Equations By Algebra – Substitution Method or Elimination Method

**Example 2:** Solve each system algebraically.

Elimination	Substitution	Elimination	Substitution
<p>a.) <math display="block">\begin{cases} 5x - 6y = -32 \\ 3x + 6y = 48 \end{cases}</math> <p style="text-align: right; color: green; font-size: small;">ADD Vertically</p> <math display="block">8x = 16</math> <math display="block">x = 2 \leftarrow \text{only half of the solution}</math> <hr style="width: 50%; margin-left: 0;"/> <math display="block">3x + 6y = 48</math> <math display="block">3(2) + 6y = 48</math> <math display="block">6 + 6y = 48</math> <math display="block">6y = 42</math> <math display="block">y = 7</math> <div style="border: 1px solid blue; border-radius: 50%; width: 60px; height: 40px; display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <span style="color: blue; font-size: 1.2em;">(2, 7)</span> </div> </p>	<p>b.) <math display="block">\begin{cases} y = x^2 - 2x - 3 \\ y = -5 \end{cases}</math> <math display="block">-5 = x^2 - 2x - 3</math> <p style="color: blue; font-size: small;">* Set equal to 0. *</p> <math display="block">0 = x^2 - 2x + 2</math> <p style="color: green; font-size: small;">FACTOR</p> <p style="color: red; font-size: small;">* Cannot be factored *</p> <div style="border: 1px solid blue; border-radius: 50%; width: 80px; height: 80px; display: flex; align-items: center; justify-content: center; margin-top: 20px;"> <span style="font-size: 2em; color: blue;">∅</span> </div> </p>	<p>c.) <math display="block">\begin{cases} 4x + 2y = 14 \\ 7x - 3y = -8 \end{cases}</math> <math display="block">12x + 6y = 42</math> <math display="block">14x - 6y = -16</math> <hr style="width: 50%; margin-left: 0;"/> <math display="block">26x = 26</math> <math display="block">x = 1</math> <hr style="width: 50%; margin-left: 0;"/> <math display="block">4x + 2y = 14</math> <math display="block">4(1) + 2y = 14</math> <math display="block">4 + 2y = 14</math> <math display="block">2y = 10</math> <math display="block">y = 5</math> <div style="border: 1px solid blue; border-radius: 50%; width: 80px; height: 40px; display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <span style="color: blue; font-size: 1.2em;">(1, 5)</span> </div> </p>	<p>d.) <math display="block">\begin{cases} y = -x^2 + 2x + 7 \\ y = -2x + 2 \end{cases}</math> <math display="block">-2x + 2 = -x^2 + 2x + 7</math> <p style="color: red; font-size: small;">↑ move to left side</p> <math display="block">x^2 - 4x - 5 = 0</math> <p style="color: green; font-size: small;">FACTOR</p> <math display="block">(x + 1)(x - 5) = 0</math> <p style="color: green; font-size: small;">Use zero product property</p> <math display="block">\begin{matrix} x + 1 = 0 &amp; x - 5 = 0 \\ x = -1 &amp; x = 5 \end{matrix}</math> <p style="color: blue; font-size: small;">* Two solutions *</p> <math display="block">y = -2x + 2</math> <math display="block">\begin{cases} y = -2(-1) + 2 \\ y = -2(5) + 2 \end{cases}</math> <math display="block">\begin{matrix} = 2 + 2 \\ = 4 \end{matrix} \quad \begin{matrix} = -10 + 2 \\ = -8 \end{matrix}</math> <div style="border: 1px solid blue; border-radius: 50%; width: 150px; height: 40px; display: flex; align-items: center; justify-content: center; margin-top: 10px;"> <span style="color: blue; font-size: 1.2em;">(-1, 4) (5, -8)</span> </div> </p>

**Example 3:** Use your calculator to find the solution to each system.

<p>a.) <math display="block">\begin{cases} y = -2x + 2 \\ y = \frac{1}{2}x + 7 \end{cases}</math></p> <p>_____</p>	<p>b.) <math display="block">\begin{cases} y = -x^2 + 2x + 4 \\ x + y = 4 \end{cases}</math></p> <p>_____</p>	<p>c.) <math display="block">\begin{cases} 4x = 7y - 14 \\ 5x + 7y = -49 \end{cases}</math></p> <p>_____</p>
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## Systems of Inequalities

– **system of inequalities** → two or more \_\_\_\_\_

• **solution of a system of inequalities** – after graphing each linear inequality from the system,

the \_\_\_\_\_ represents the “solution”