Unit 8 - Systems - Study Guide

Solving Linear Systems

GRAPHICALLY

Steps

1. Graph and label both equations
2. Find where the 2 lines intersect
3. Label point of intersection
4. Check using substitution

Using the TI-N-Spire

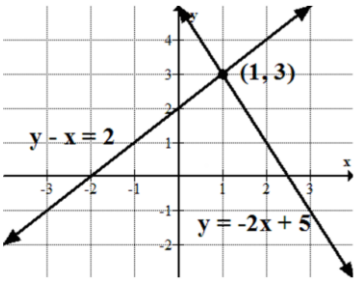
1. Graph the two lines
2. Change the window to view the intersection
3. MENU → 6 → 4 → shade over each intersection separately
4. Verify in your table: CTRL→T

Example

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

$y - x = 2$
$y = 1x + 2$
Start @ (0,2)
1↑ 1→

$y = -2x + 5$
Start @ (0,5)
-2↓ 1→



Solution: (1,3)

SUBSTITUTION

Steps

1. Solve for a variable (either x or y or both)
2. Substitute
3. Solve for the remaining variable
4. Substitute your new value back into one of the equations then solve to get the other variable
5. Circle your final answer
6. Check using substitution

Example

$$y - x = 3$$
$$x + y = 7$$

$y - x = 3$
$y = x + 3$

$x + y = 7$
$x + (x + 3) = 7$
$2x + 3 = 7$
$-3 \quad -3$
$\frac{2x}{2} = \frac{4}{2}$
$x = 2$

$x + y = 7$
$2 + y = 7$
$-2 \quad -2$
$y = 5$

Solution: (2,5)

ELIMINATION

Steps

1. Sort to line up the variables and equal signs
2. Multiply one or both equations by a **constant** to create the additive inverse of one of the variables
3. Add or subtract both equations to eliminate one of the variables (the one that has the **additive inverse**)
4. Solve for the variable that remains
5. Substitute your new value back into one of the equations (it doesn't matter which one so pick the easier one) then solve to get the other variable
6. Circle your final answer
7. Check using substitution

Example

$2(3x - y = 17)$ → $6x - 2y = 34$
$2x + 2y = 14$ → $+\ 2x + 2y = 14$

$\frac{8x}{8} = \frac{48}{8}$
$x = 6$

$3x - y = 17$
$3(6) - y = 17$
$18 - y = 17$
$-18 \quad -18$
$\frac{-y}{-1} = \frac{-1}{-1}$
$y = 1$

Solution: (6,1)

Solving Linear/Quadratic Systems

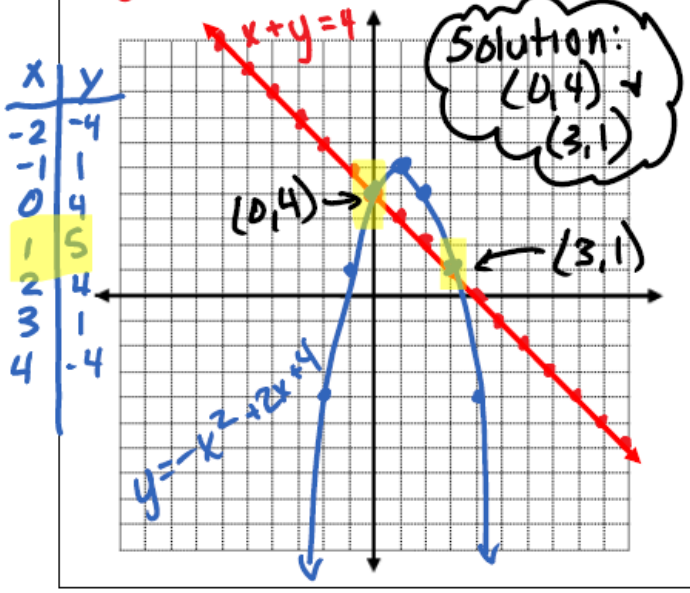
Algebraically	Graphically
Solve using SUBSTITUTION ▪ set them both = y then = to each other ▪ set one = y and substitute y into the other	Graph both and find the points of intersection ▪ line: write in y = mx + b form ▪ quadratic: use table of values

2. Solve this system of equations graphically AND algebraically.

$y = -x^2 + 2x + 4$
$x + y = 4$

$x+y=4$ $m=-\frac{1}{1}$ $b=4$
$y=-x+4$

GRAPHICALLY



ALGEBRAICALLY

$y=4-x$

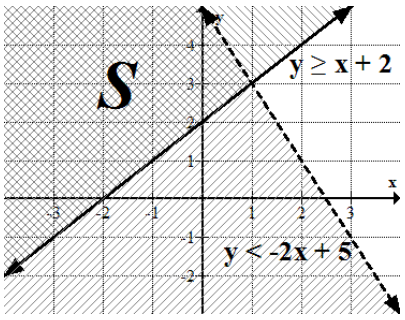
$-x^2+2x+4=4-x$
$+x^2 \quad -2x \quad -4 \quad -4 \quad -2x \quad +x^2$
$0=x^2-3x$
$0=x(x-3)$
$x-3=0$
$x=3$

$0=x$
$0+y=4$
$y=4$

$3+y=4$
$y=1$

Solution: (0,4) & (3,1)

Solving a System of Linear Inequalities

Steps:	Example:	
1. Graph and label both inequalities 2. Find where the shaded regions overlap and label with an "S" • Solutions are in the overlapping region (NOT on dashed lines – so if the point of intersection is on two dashed lines, it is NOT a solution!)		• (1, 3) IS NOT a solution because one of the lines is dashed • (−2, 3) IS a solution because it is in the shaded region of both inequalities

Real Life Applications of Systems

General steps:	Things to be careful of:
1. Define any unknown things and write them as variables (Let x = and y =) 2. Find two equations or inequalities that model the situation 3. Use your methods of solving to find the values of both variables	– Did they restrict the domain? – Does your answer make sense? – Did you use correct units?