Solving Systems of Equations By Algebra – Substitution Method or Elimination Method

Example 2: Solve each system algebricaly.

a.) Elimination
$\begin{cases} 5x-6y=-32 \\ 3x+6y=48 \end{cases}$ ADD vertically

$8x=16$

$x=2$ ← only half of the solution

$3x+6y=48$

$3(2)+6y=48$

$6+6y=48$

$6y=42$

$y=7$

$(2,7)$

b.) Substitution
$\begin{cases} y=x^2-2x-3 \\ y=-5 \end{cases}$

$-5=x^2-2x-3$

* Set equal to 0. *

$0=x^2-2x+2$

FACTOR

* Cannot be factored *

$\emptyset$

c.) Elimination
$\begin{cases} 4x+2y=14 \\ 7x-3y=-8 \end{cases}$ ×3, ×2

$12x+6y=42$

$14x-6y=-16$

$26x=26$

$x=1$

$4x+2y=14$

$4(1)+2y=14$

$4+2y=14$

$2y=10$

$y=5$

$(1,5)$

d.) Substitution
$\begin{cases} y=-x^2+2x+7 \\ y=-2x+2 \end{cases}$

$-2x+2=-x^2+2x+7$

↑ move to left side

$x^2-4x-5=0$

factor

$(x+1)(x-5)=0$

Use zero product property

$x+1=0$ $\quad x-5=0$

$x=-1$ $\quad x=5$

* Two solutions *

$y=-2x+2$

$y=-2(-1)+2$
$=2+2$
$=4$

$y=-2(5)+2$
$=-10+2$
$=-8$

$(-1,4)$ $(5,-8)$

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

1) ALL eqns must be in $y=$ form.
2) Put all eqns into [Y=] $Y_1=, Y_2=, Y_3=\ldots$
3) [Graph]; MUST be able to SEE the Point(s) of Intersection
4) [2nd] [Trace] #5: Intersect [Enter] x3
5) Write solution as (x,y)

a.) $\begin{cases} y=-2x+2 \\ y=\frac{1}{2}x+7 \end{cases}$

$(-2,6)$

b.) $\begin{cases} y=-x^2+2x+4 \\ x+y=4 \end{cases}$ ← solve for "y"

$\hookrightarrow y=-x+4$

$(0,4)$ and $(3,1)$

c.) $\begin{cases} 4x=7y-14 \\ 5x+7y=-49 \end{cases}$ $\rightarrow 7y=4x+14 \rightarrow y=\frac{4}{7}x+$ $\rightarrow 7y=-5x-49 \rightarrow y=-\frac{5}{7}x-$

$(-7,-2)$

Systems of Inequalities $<$ $>$ $\leq$ $\geq$

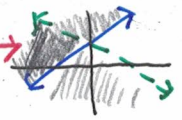
Less than, Greater than

– **system of inequalities** → two or more inequalities that are Graped together

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

the Region (area) where the SHADING Overlaps represents the "solution"

Solutions →



- **Shading and Type of Line Rules:** $y=mx+b$ → $y=ax^2+bx+c$
  - To use these rules → inequality must be SOLVED for "y" and "y" must be on LEFT side.
  - Remember → If MULTIPLY or DIVIDE by a Negative # , you must reverse the symbol

Calculator $Y_1=$

a.) $>$ → shade Above line and have a dotted line

b.) $\geq$ → shade Above line and have a solid line

c.) $<$ → shade Below line and have a dotted line

d.) $\leq$ → shade Below line and have a solid line

ie.. $\frac{-2y}{-2} > \frac{4x-8}{-2}$ → $y < -2x+4$

- If have troubling figuring out where to shade, plug in the point (0,0) in the inequality →

DO shade in area if get a TRUE statement **OR** DO NOT shade in area if get a FALSE statement

Example 4: Graph each system of inequalities.

a.) $\begin{cases} 2x-y<4 \\ 3x+4y<12 \end{cases}$

Solve for "y"

$2x-y<4$

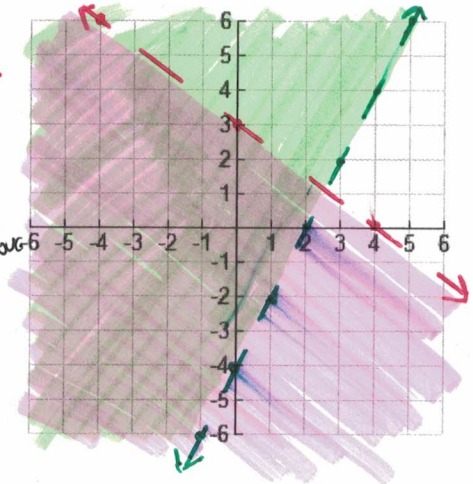
$-y < -2x+4$ (dotted, above)

$y > 2x-4$

$3x+4y<12$

$4y < -3x+12$

$y < -\frac{3}{4}x+3$ (dotted, below)



b.) $\begin{cases} x-2y \leq -2 \\ x-2y \geq 4 \end{cases}$

Solve both for "y"

$x-2y \leq -2$

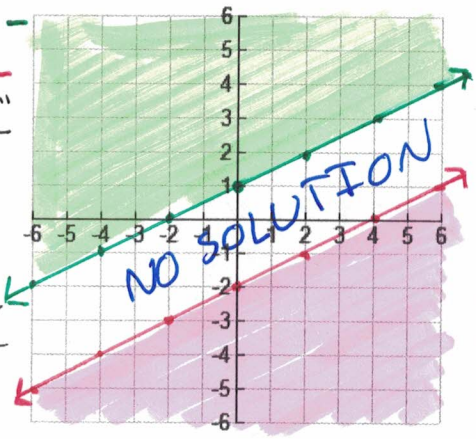
$-2y \leq -x-2$

$y \geq \frac{1}{2}x+1$ (solid, above)

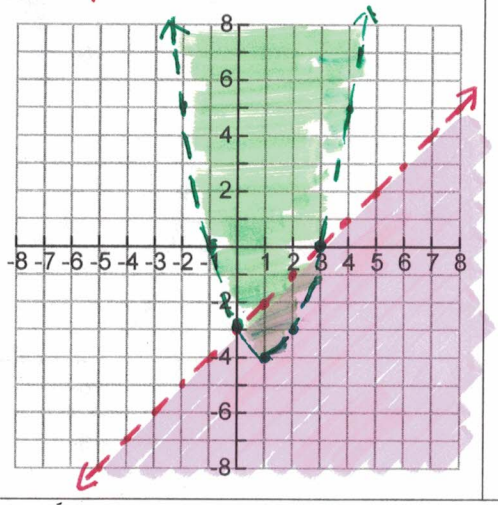
$x-2y \geq 4$

$-2y \geq -x+4$

$y \leq \frac{1}{2}x-2$ (solid, below)



c.) $\begin{cases} y > x^2-2x-3 \\ y < x-3 \end{cases}$ dotted, above / dotted, below



d.) $\begin{cases} y > 1 \\ y \geq -x^2-4x+1 \end{cases}$ dotted, above