1 If the point (7, 2) is a solution of an inequality in x and y, then the inequality is satisfied when we replace x by [7] and y by [2]. Is the point (7, 2) a solution of the inequality $4x - 2y \geq 1$?

$4x-2y \geq 1$

$(7,2)?$ $4(7)-2(2) = 28-4 = 24 > 1$

so ≥ 1

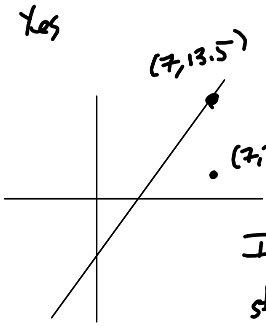
Yes

x	y
0	$-\frac{1}{2}$
$\frac{1}{4}$	0
7	

$4(7)-2y=1$

$-2y=-27$

$y=\frac{27}{2}=13.5$

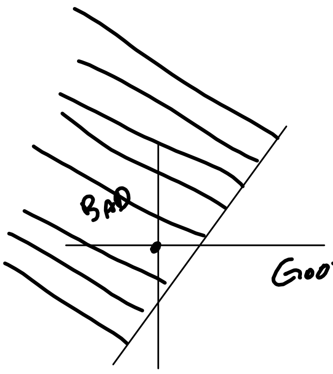


(7,2) is good.

I scratch out the bad stuff.

This makes it easier to see the "good stuff."

Usually, I test (0,0) when it's not on the line. Otherwise, I pick (1,0) or (0,1).



GOOD STUFF.

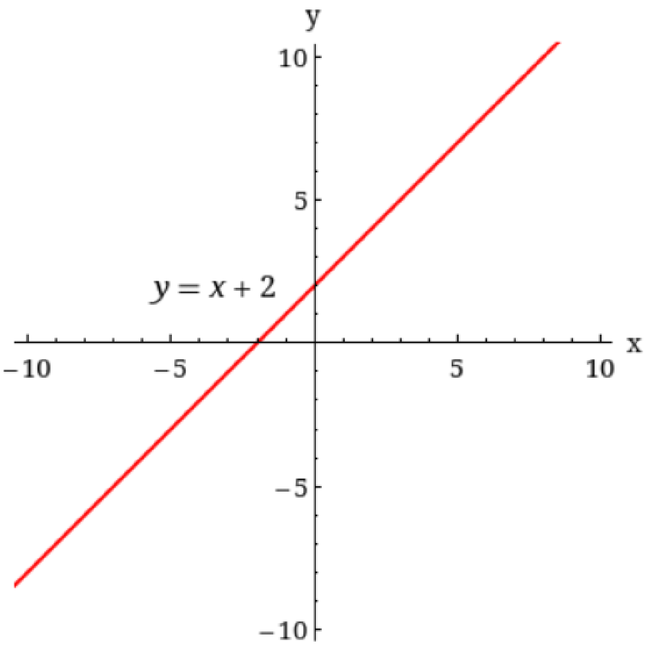
Test (0,0)

$0-0 = 0 \geq 1?$

NO.

(0,0) BAD.

2 Consider the following.

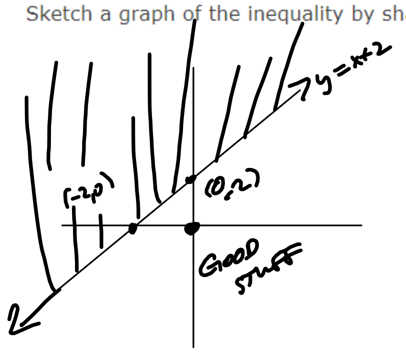


To graph an inequality, we first graph the corresponding ---Select--- . So to graph $y \leq x + 2$, we first graph the equation [ ] . To decide which side of the graph of the equation is the graph of the inequality, we use ---Select--- points.

Complete the table.

Test point	Inequality $y \leq x + 2$	Conclusion
(0, 0)	---Select---	---Select---
(0, 3)	---Select---	---Select---

Sketch a graph of the inequality by shading the appropriate region.



$y = x + 2$

x	y
0	2
-2	0

$0 \leq 0 + 2 = 2$

Yes!

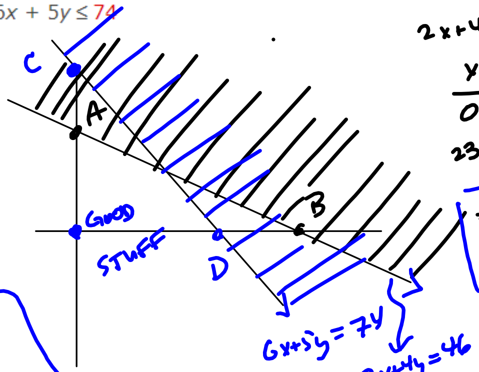
(0,0) GOOD!

TARZAN LIKE

3 If the point (4, 9) is a solution of a *system* of inequalities in *x* and *y*, then *each* inequality is satisfied when we replace *x* by [4] and *y* by [9]. Is the point (4, 9) a solution of the following system?

$$\begin{cases} 2x + 4y \le 46 \\ 6x + 5y \le 74 \end{cases}$$

YES



$2x+4y=46$

x	y
0	$\frac{23}{2}=11.5$
23	0

$4y=46$

(0,0): $0 \le 46$? Yes.

(0,0) GOOD

A = (0, 11.5)
B = (23, 0)

$6x+5y \le 74$

x	y
0	$\frac{74}{5} = 14.8$
$12.\overline{3} = \frac{37}{3} = \frac{74}{6}$	0

$0 \le 74$?
Yes
(0,0) GOOD

C = (0, 14.8)
D = $(12.\overline{3}, 0)$

(4, 9)?

$2(4)+4(9) = 8+36 = 44 < 46$ ✓

$6(4)+5(9) = 24+45 = 69 < 74$ ✓

All the question was asking!

4

Shade the solution of each system of inequalities on the given graph.

(a) $\begin{cases} x - y \geq 0 \\ x + y \geq 2 \end{cases}$

Warning: MY way is better for hand sketches, but WebAssign wants the feasible region (the solution set of the system) to be shaded.

Test
(1,0)
$1-0 \geq 0$?
$1 \geq 0$?
Yes
(1,0) GOOD

$x - y \geq 0$

x	y
0	0
0	0
1	1

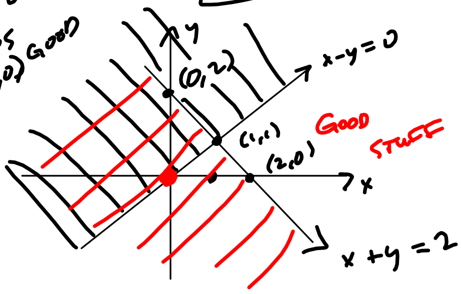
$\boxed{(0,0) = A \quad (1,1) = B}$

$x + y \geq 2$

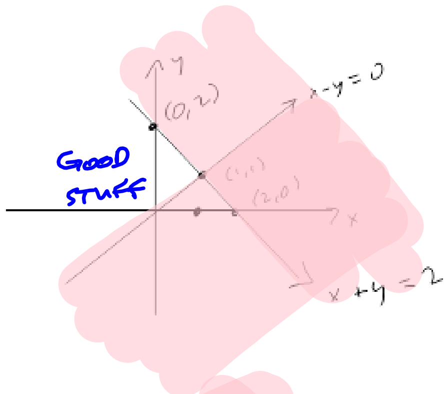
x	y
0	2
2	0

$\boxed{(0,2) = C \quad (2,0) = D}$

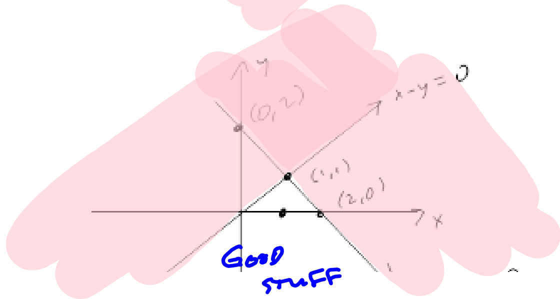
$0 \geq 2$?
No
(0,0) BAD



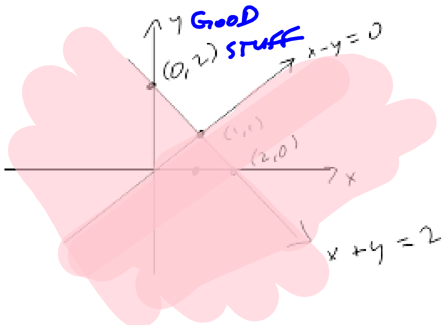
(b) $\begin{cases} x - y \leq 0 \\ x + y \leq 2 \end{cases}$ $1 \leq 0$? No. (1,0) BAD
$0 \leq 2$? Yes (0,0) GOOD



(c) $\begin{cases} x - y \geq 0 \\ x + y \leq 2 \end{cases}$ $1 \geq 0$? Yes (1,0) GOOD.
$0 \leq 2$? . (0,0) GOOD

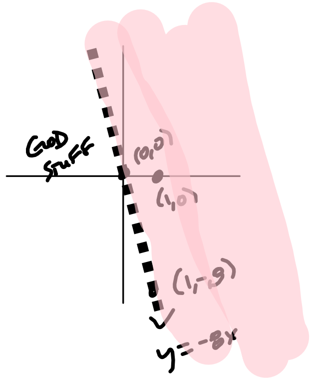


(d) $\begin{cases} x - y \leq 0 \\ x + y \geq 2 \end{cases}$ $1 \leq 0$?! (1,0) BAD
$0 \geq 2$?! (0,0) BAD



5 Graph the inequality.

$y < -8x$



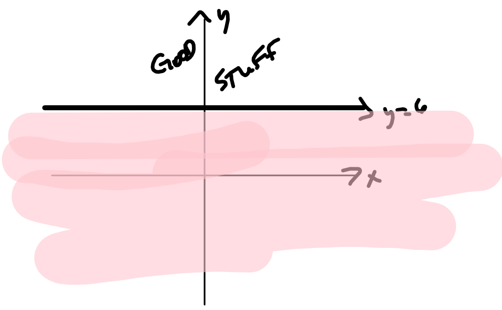
$0 < -8(1) = -8?$

NO

(1,0) BAD

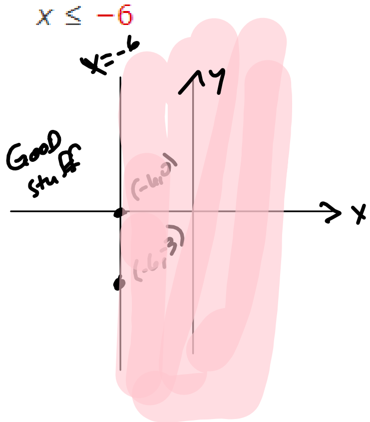
6 Graph the inequality.

$y \geq 6$



7 Graph the inequality.

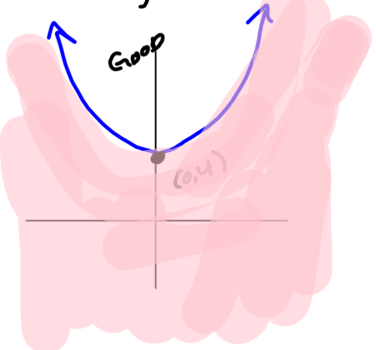
$x \leq -6$



10 Graph the inequality.

$-x^2 + y \geq 4$ $\Rightarrow$

$y \geq x^2+4$

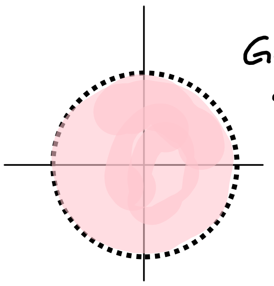


(0,4)
(1,5)

12 Graph the inequality.

$x^2 + y^2 > 9$ Outside the boundary
Dotted Boundary

circle of radius $r=3$



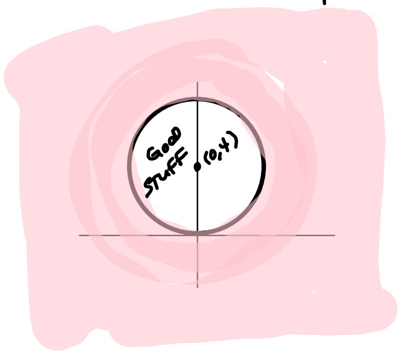
Good stuff

13 Graph the inequality.

$x^2 + (y - 4)^2 \le 16$

$(h,k) = (0,4)$

$r = 4 = \sqrt{16}$



Graph the solution set of the system of inequalities.

15 $\begin{cases} 2x + 3y > 9 \\ 3x - y < 23 \end{cases}$

$2x+3y>9$

x	y
0	3
$4.5 = \frac{9}{2}$	0
6	-1

WebAssign: Find an integer grid point!

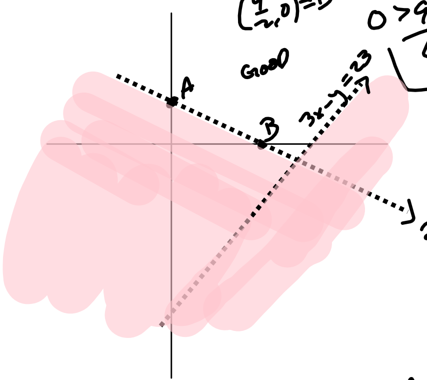
$(0,3) = A$

$(\frac{9}{2}, 0) = B$

$(6,-1)$ For WebAssign

$0 > 9$? No

$\boxed{(0,0) \text{ BAD}}$



GRID POINTS: x's divisible by 6

y's divisible by 5

$3x - y < 23$

x	y
0	-23
$7.6 = \frac{23}{3}$	0
8	1

W.A.

$0 < 23 \implies$

$\boxed{(0,0) \text{ Good}}$

Vertex

$2x + 3y = 9$ E1

$3x - y = 23$ E2

E2 $3x - y = 23$

3E2+E1 $11x = 78$

$\boxed{x = \frac{78}{11}}$

$2\left(\frac{78}{11}\right) + 3y = 9$

$156 + 33y = 99$

$33y = -57$

$y = -\frac{57}{33} = \boxed{-\frac{19}{11}}$

$2x + 3y = 9$

$3y = -2x + 9$

$y = \frac{-2x+9}{3} = -\frac{2}{3}x + 3$

$3x - y = 23$

$-y = -3x + 23$

$\boxed{y = 3x - 23}$

For WebAssign

X	Y1	Y2
-6	7	-41
-3	5	-32
0	3	-23
3	1	-14
6	-1	-5
9	-3	4
12	-5	13

X=12

(-3,5)
(12,-5) } Grid points

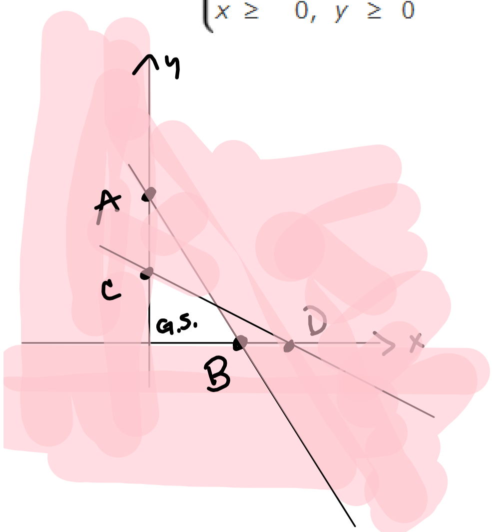
(6,-5)

(9,4) At least x is divisible by 3.

Graph the solution set of the system of inequalities.

18

$$\begin{cases} y \le -2x + 10 \\ y \le -\frac{1}{2}x + 7 \\ x \ge 0,\ y \ge 0 \end{cases}$$



Standard Linear Programming constraints.

In linear programming, this is standard for a maximization problem: Maximize profit, subject to the constraints.

This system of inequalities basically gives you the region from which points can come.

In general, the "objective function" will be optimized at one of the corner points of the feasible region.

Feasible Region is the solution set of the constraints (i.e., of the system of linear equations.

$y \le -2x+10$

x	y
0	10
5	0

$\boxed{A=(0,10) \quad B=(5,0)}$

$0 \le 10?$

$\boxed{(0,0) \text{ GOOD}}$

$y \le -\frac{1}{2}x+7$

x	y
0	7
14	0

$\boxed{C=(0,7) \quad D=(14,0)}$

$0 \le 7?$

$\boxed{(0,0) \text{ GOOD}}$

Maximize

Profit $= P = 10x - 2y$

$-2y = -10x$

$y = 5x$ is slope

$m=5$

FIND ALL CORNER POINTS (VERTICES)

(0,7)
(5,0)
(0,0)

Vertices & (2,6) (See below.)

4th one is where $y=-2x+10$ & $y=-\frac{1}{2}x+7$ intersect:

$$\left(-2x+10 = -\tfrac{1}{2}x+7\right)(2)$$

$$-4x+20 = -x+14$$

$$-3x = -6$$

$$\boxed{x=2} \Rightarrow y = -2(2)+10 = \boxed{6=y}$$

Graph the solution set of the system of inequalities.

20

$$\begin{cases} x > 0 \\ y > 0 \\ x + y < 15 \\ x^2 + y^2 > 49 \end{cases}$$

$\boxed{\begin{array}{l} A = (0,7) \\ B = (7,0) \end{array}}$

$x+y < 15$

$(0,15) = C$

$(15,0) = D$

$0 < 15$? $(0,0)$ ✓

CORNERS / Vertices :

$(0,7), (7,0), (0,15), (15,0)$