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NOTES: Section 7.6 – Systems of Linear Inequalities

Goals: #1 - I can graph a system of linear inequalities.

Homework: Section 7.6 Worksheet

Warm Up:

1. Use the graphing method to solve the linear system and tell how many solutions the system has.

$-x + 4y = -20$

$4y = x - 20$

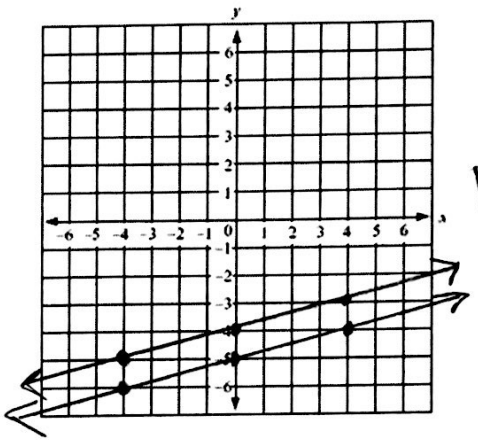
$y = \frac{1}{4}x - 5$

$3x - 12y = 48$

$-12y = -3x + 48$

$y = \frac{3}{12}x - 4$

$y = \frac{1}{4}x - 4$



no solution

2. Use substitution or elimination to solve the linear system and tell how many solutions the system has.

$-6x + 2y = -2$

$2(-4x - y = 8)$

$-8x - 2y = 16$

$+ \quad -6x + 2y = -2$

$-14x = 14$

$x = -1$

$-6(-1) + 2y = -2$

$6 + 2y = -2$

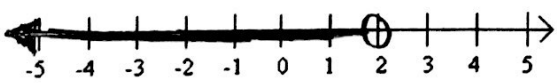
$2y = -8$

$y = -4$

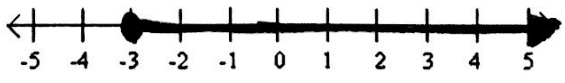
One solution (-1, -4)

Exploration #1: Work with a partner and graph the following inequalities on a number line.

1. $x < 2$



2. $x \geq -3$



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Exploration #2: Work with a partner.

1. Which of the following ordered pairs are solutions of $3x + 4y > 8$?

a. $(6, -3)$

$3(6)+4(-3) \stackrel{?}{>} 8$

$18-12>8$

$6 \not> 8$

NO

b. $(-2, -1)$

$3(-2)+4(-1)>8$

$-6-4>8$

$-10 \not> 8$

NO

c. $(3, 2)$

$3(3)+4(2)>8$

$9+8>8$

$17>8$ ✓

Yes

d. $(0, 2)$

$3(0)+4(2)>8$

$0+8>8$

$8 \not> 8$

NO

Notes:

To graph linear inequalities, we need to first graph the function.

We use a dashed line for $<, >$ and a solid line for $\leq, \geq$.

Then, we test points not on the line to determine where to shade.

Example #1: How would we represent this on a graph?

1. $y \leq -3$

① Graph $y = 3$

② Solid or dashed?
↳ $\leq$

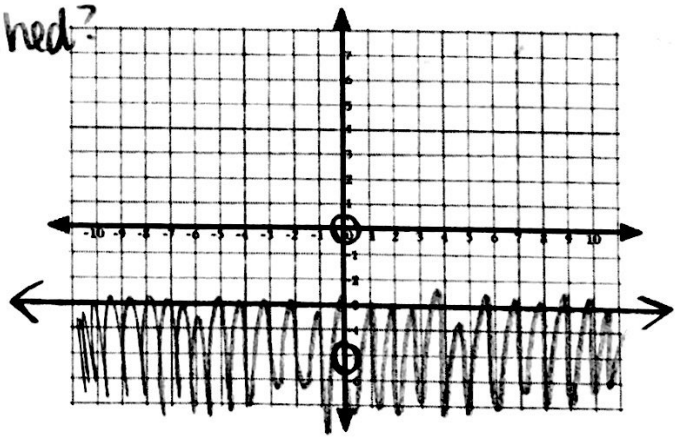
③ Shade?
↳ Test

Test:

x	y
0	0
No	
0	-5
Yes	

$0 \stackrel{?}{\leq} -3$

$-5 \stackrel{?}{\leq} -3$



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Example #2: Graph $y > -2x$

① Graph $y = -2x$
↳ y-int: (0,0)
↳ slope: $-\frac{2}{1}$

② Solid or dashed?
↳ >

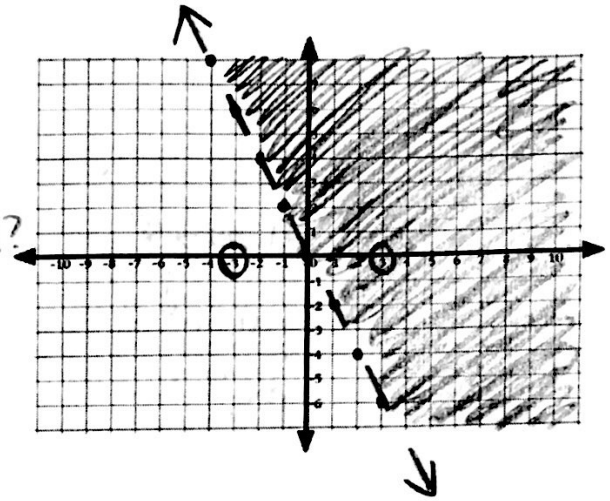
③ Shade?
↳ Test

Test:

x	y
3	0
Yes	
-3	0
No	

$0 > -2(3)$
$0 > -6$

$0 > -2(-3)$
$0 > 6$



Example #3: Graph $5x - 2y \leq -4$

① Graph $5x - 2y = -4$
$-2y = -5x - 4$
$y = \frac{5}{2}x + 2$
↳ y-int: (0,2)
↳ slope: $\frac{5}{2}$

② Solid or dashed?
↳ $\leq$

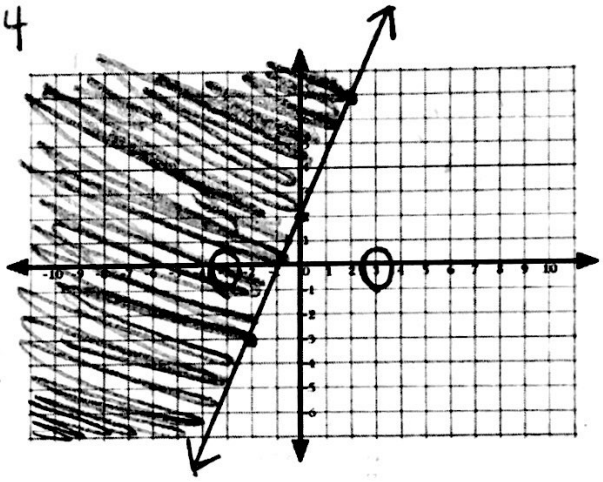
③ Shade?
↳ Test

Test:

x	y
3	0
No	
-3	0
Yes	

$5(3) - 2(0) \leq -4$
$15 - 0 \leq -4$
$15 \leq -4$

$5(-3) - 2(0) \leq -4$
$-15 - 0 \leq -4$
$-15 \leq -4$



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Warm Up: Graph $x + 2y \leq 6$

Test:

x	y
0	0
Yes	
0	6
No	

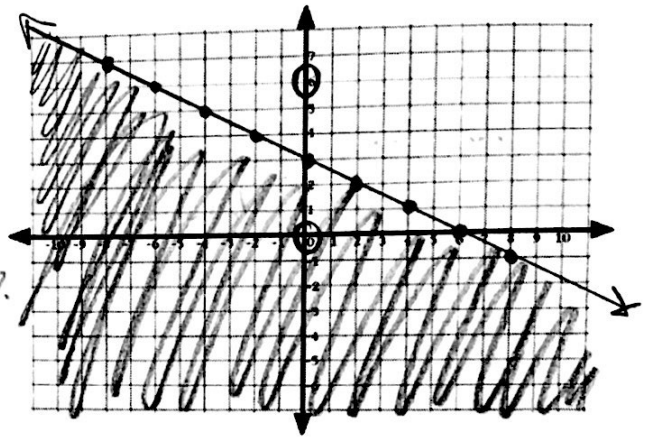
$(0) + 2(0) \leq 6$
$2 \leq 6$

$(0) + 2(6) \leq 6$
$12 \leq 6$

① Graph $x + 2y = 6$
$2y = -x + 6$
$y = -\frac{1}{2}x + 3$
↳ y-int: $(0, 3)$
↳ slope: $-\frac{1}{2}$

② solid or dashed?
↳ $\leq$

③ shade?
↳ Test



Exploration #3: Work with a partner. Graph both linear inequalities on the same graph.

Test:

1: $y > -2x - 5$

x	y
0	0
5	0

$(0) > -2(0) - 5$
$0 > -5$ ✓ Yes
$(0) > -2(-5) - 5$
$0 \not> 5$ No

2: $y \leq x + 3$

x	y
0	0
0	5

$0 \leq 0 + 3$
$0 \leq 3$ ✓ Yes
$5 \leq 0 + 3$
$5 \not\leq 3$ No

① $y = -2x - 5$
↳ y-int: $(0, -5)$
↳ slope: $-\frac{2}{1}$

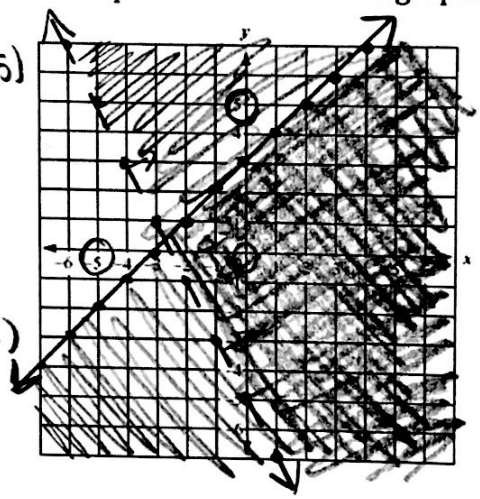
② dashed
↳ $>$

③ shade?

① $y = x + 3$
↳ y-int: $(0, 3)$
↳ slope: $\frac{1}{1}$

② solid
↳ $\leq$

③ shade?



Identify the region that is shaded on both graphs.

dark shade

Exploration #4: Work with a partner. Graph both linear inequalities on the same graph.

Test:

1: $2x + 3y < 6$

x	y
0	0
0	3

$2(0) + 3(0) < 6$
$0 < 6$ ✓ Yes
$2(0) + 3(3) < 6$
$9 \not< 6$ No

2: $y \geq -\frac{2}{3}x + 4$

x	y
0	3
0	5

$3 \geq -\frac{2}{3}(0) + 4$
$3 \not\geq 4$ No
$5 \geq -\frac{2}{3}(0) + 4$
$5 \geq 4$ ✓ Yes

① $2x + 3y = 6$
$3y = -2x + 6$
$y = -\frac{2}{3}x + 2$
slope y-int

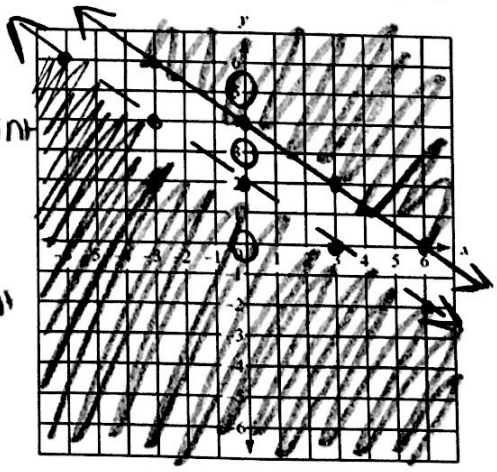
② dashed (<)

③ shade?

① $y = -\frac{2}{3}x + 4$
slope y-int

② solid ($\geq$)

③ shade?



Identify the region that is shaded on both graphs.

NO solution

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Notes:

A system of linear inequalities consists of two linear inequalities

The solution of a system of inequalities is the graph of all solutions of the system (the region where the shading overlaps).

When there is NO shaded region that overlaps, the system has no solution

Example #4: Graph the system of inequalities.

1. $x + y < 3$

① $y = -x + 3$ (slope, y-int)

② Dashed

↳ $x + 4y \geq 0$

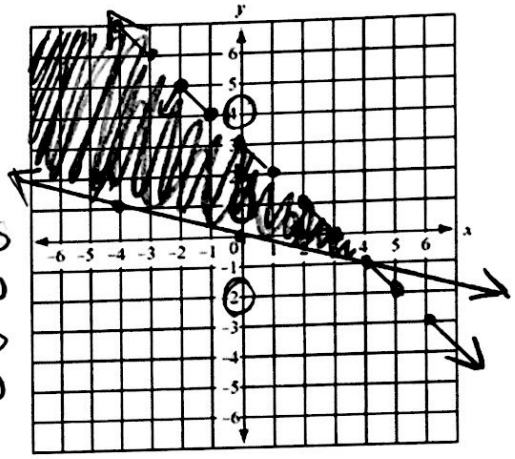
① $4y = -x + 0$

$y = -\frac{1}{4}x + 0$ (slope, y-int)

② Solid

Test:

	x	y	
1:	0	1	Yes
	0	4	NO
2:	0	1	Yes
	0	-2	NO



Example #5: Graph the system of inequalities.

1. $y < 2$

① $y = 2$

② Dashed

↳ $x \geq -1$

① $x = -1$

② Solid

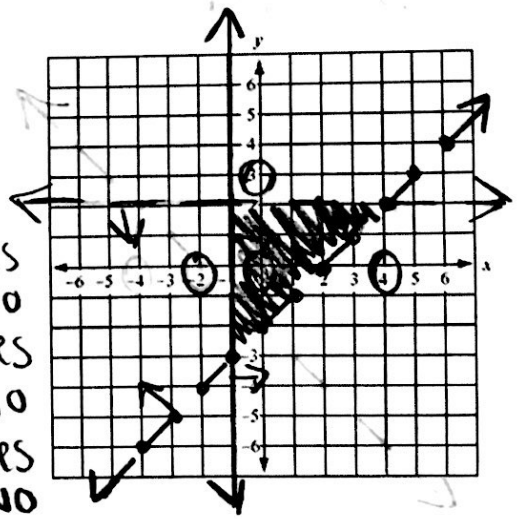
↳ $y > x - 2$

① $y = x - 2$ (slope, y-int)

② Dashed

Test:

	x	y	
1:	0	0	Yes
	0	3	NO
2:	0	0	Yes
	-2	0	NO
3:	0	0	Yes
	4	0	NO



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Example #6: Graph the system of inequalities.

1. $y < 3$

① $y = 3$

② Dashed

↳ <

$y > 1$

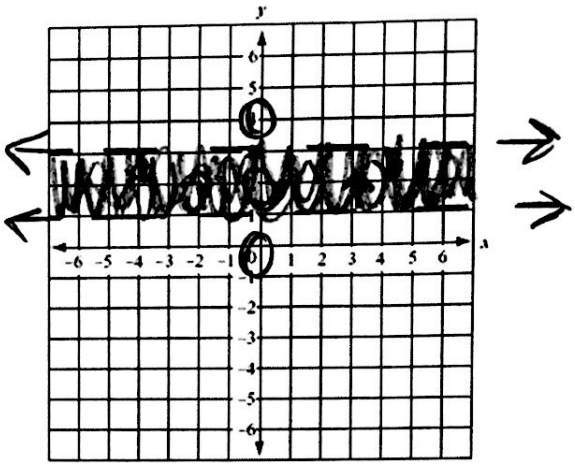
① $y = 1$

② Dashed

↳ >

Test:

	x	y	
1:	0	2	yes
	0	4	NO
2:	0	0	NO
	0	2	yes



CHALLENGE: Graph the system of inequalities.

1. $x \leq 10$

$x \geq -2$

$3x + 2y < 6$

$2y = -3x + 6$

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

$6x + 4y > -12$

$4y = -6x - 12$

$y = \frac{-6}{4}x - 3$

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