HOMEWORK...

p. 221: #5, 7, 8, 9

1) Declare variables
2) State restrictions
3) Develop inequation
4) Graph solution set

5. Graph the solution set for each linear inequality.

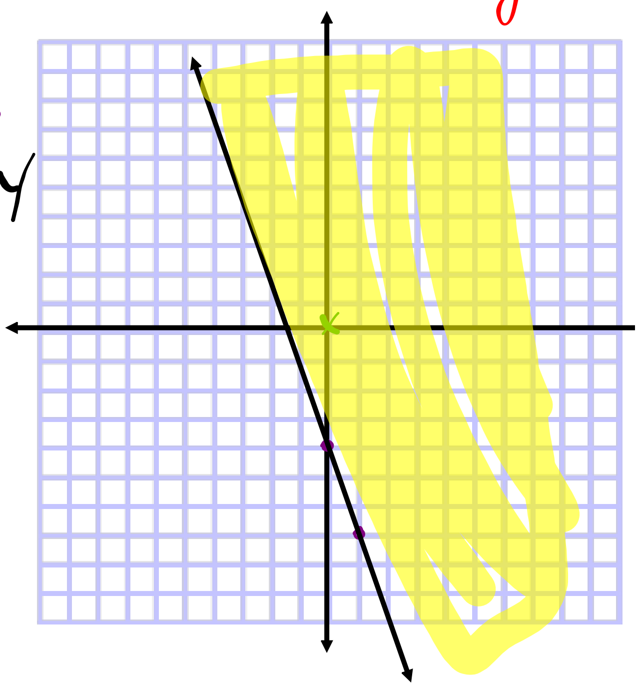
a) $y > -2x + 8$
b) $-3y \le 9x + 12$
c) $y < 6$
d) $-4x - 8 > 4$
e) $10x - 12 < -y$
f) $4x + 3y \ge -12$

LS	$\le$	RS
$-3(0)$		$9(0) + 12$
0	$\le$	12

yes

$$\frac{-3y}{-3} = \frac{9x}{-3} + \frac{12}{-3}$$

$$y \le -3x - 4$$



7. Grace's favourite activities are going to the movies and skating with friends. She budgets herself no more than $75 a month for entertainment and transportation. Movie admission is $9 per movie, and skating costs $5 each time. A student bus pass for the month costs $25.

a) Define the variables and write a linear inequality to represent the situation.

b) What are the restrictions on the variables? How do you know?

c) Graph the linear inequality. Use your graph to determine:

i) a combination of activities that Grace can afford and still have some money left over

ii) a combination of activities that she can afford with no money left over

iii) a combination of activities that will exceed her budget

Variables

a) $x \rightarrow$ # of movie

$y \rightarrow$ # of skating

b) Restrictions

$x \in W$

$y \in W$

a) Linear Inequation

$9x + 5y + 25 \leq 75$

$9x + 5y + 25 = 75$

x-int

$9x + 5(0) + 25 = 75$

$9x = 75 - 25$

$9x = 50$

$\frac{9x}{9} = \frac{50}{9}$

$x = 5.5$

$(5.5, 0)$

y-int

$9(0) + 5y + 25 = 75$

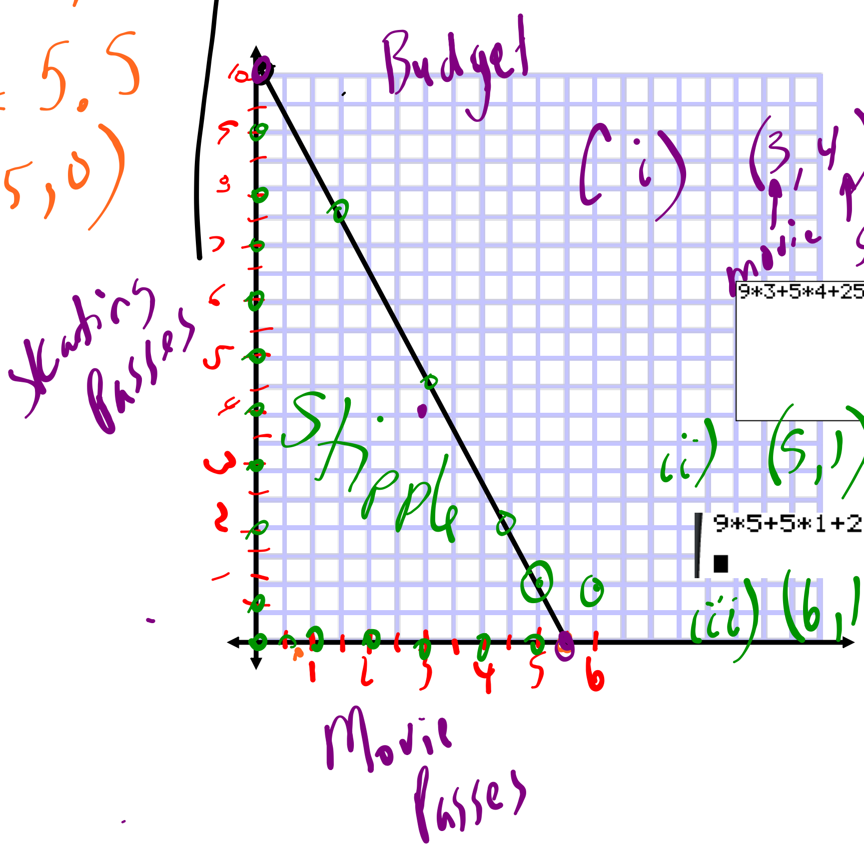
$5y = 75 - 25$

$5y = 50$

$\frac{5y}{5} = \frac{50}{5}$

$y = 10$

$(0, 10)$



c i) (3, 4) movie skating

9*3+5*4+25 72

ii) (5, 1)

9*5+5*1+25 75

iii) (6, 1)

9. For every teddy bear that is sold at a fundraising banquet, \$10 goes to charity. For every ticket that is sold, \$32 goes to charity. The organizers' goal is to raise at least \$5000. The organizers need to know how many teddy bears and tickets must be sold to meet their goal.

a) Define the variables and write a linear inequality to represent the situation.

b) What are the restrictions on the variables? How do you know?

c) Graph the linear inequality to help you determine whether each of the following points is in the solution set. The first coordinate is the number of teddy bears and the second is the number of tickets.

i) (400, 20) No ii) (205, 98) Yes iii) (156, 105) No

a) $x \to$ # of bears
$y \to$ # of tickets

b) $x \in W$
$y \in W$

$10x + 32y \geq 5000$

$10x + 32y = 5000$

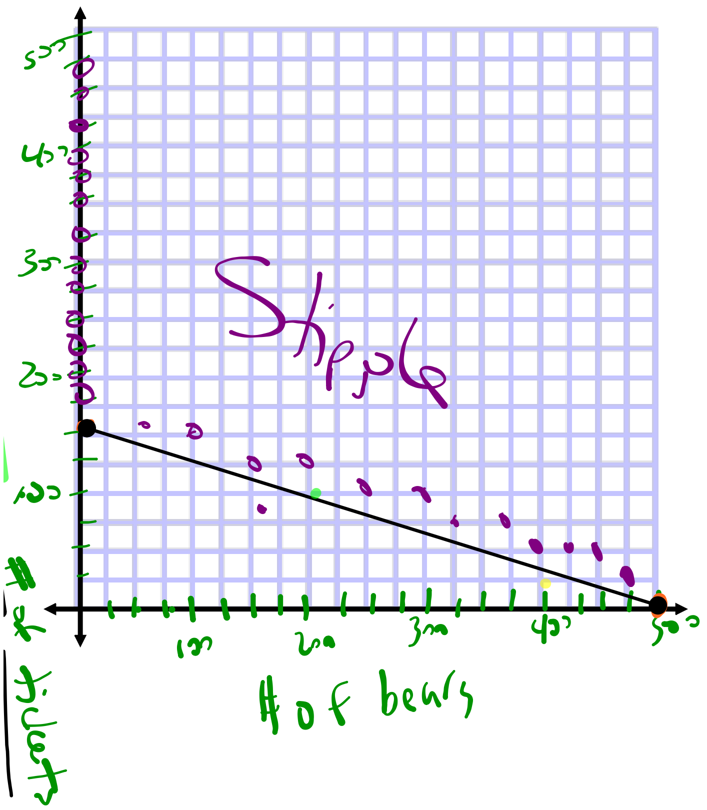
LS	$\geq$ RS
$10(400) + 32(20)$	5000

```
10*400+32*20
            4640
```

x-int
$10x + 32(0) = 5000$
$x = 500$
$(500, 0)$

y-int
$10(0) + 32y = 5000$
$y = 156.25$
$(0, 156.25)$

c)



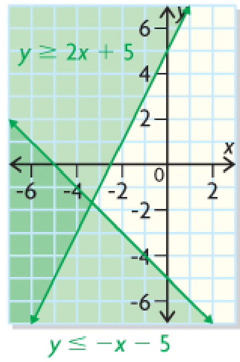
5.3 Graphing to Solve Systems of Linear Inequalities

GOAL

Solve problems by modelling systems of linear inequalities.

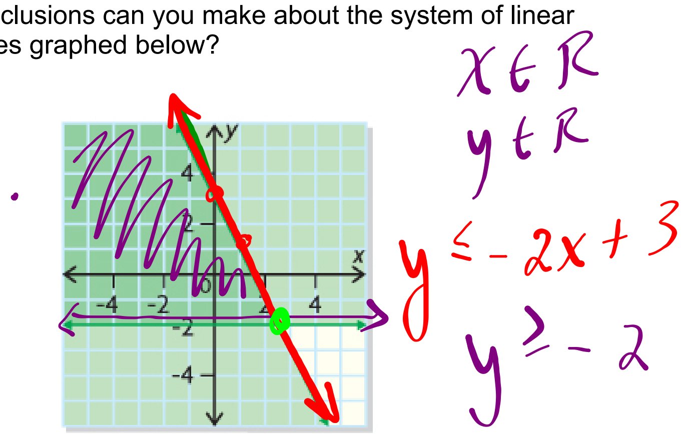
system of linear inequalities

A set of two or more linear inequalities that are graphed on the same coordinate plane; the intersection of their solution regions represents the solution set for the system.



EXPLORE...

- What conclusions can you make about the system of linear inequalities graphed below?



SAMPLE ANSWER

Any or all of the following solutions are acceptable:

- It represents a system of two linear inequalities, each with a straight boundary and a solution region.
- One linear inequality is $y \leq -2x + 3$, and the horizontal inequality is $y \geq -2$. I determined $y \leq -2x + 3$ using the slope and y-intercept and the form $y = mx + b$, and I was able to identify $y \geq -2$ because it's a horizontal line through -2 on the y-axis.
- Both inequalities include the possibility of equality because the boundaries are solid.
- The solution set of the system is represented by the overlapping region because it's where the solution regions for the two linear inequalities overlap. The solution set includes points along the boundaries of the overlap.
- The domain and range are from the set of real numbers because the solution region is green and not stippled.
- All four quadrants are included so there are no restrictions on the set of real numbers.

Solving Systems of Linear Inequalities

A **system of linear inequalities** is an extension of a system of linear equations and consists of two (or more) linear inequalities that have the same variables. For example, $2x + 3y < 4$ and $3x + 4y < 5$ constitute a system of inequalities if x represents the same item in both equations, y represents the same item in both equations, and both equations describe the same context.

Example #1:

Graph the following system and determine a possible solution

$$\{(x,y) \mid y \leq 3x - 1, x \varepsilon R, y \varepsilon R\}$$

$$\left\{(x,y) \mid y > -\frac{1}{3}x + 4, x \varepsilon R, y \varepsilon R\right\}$$

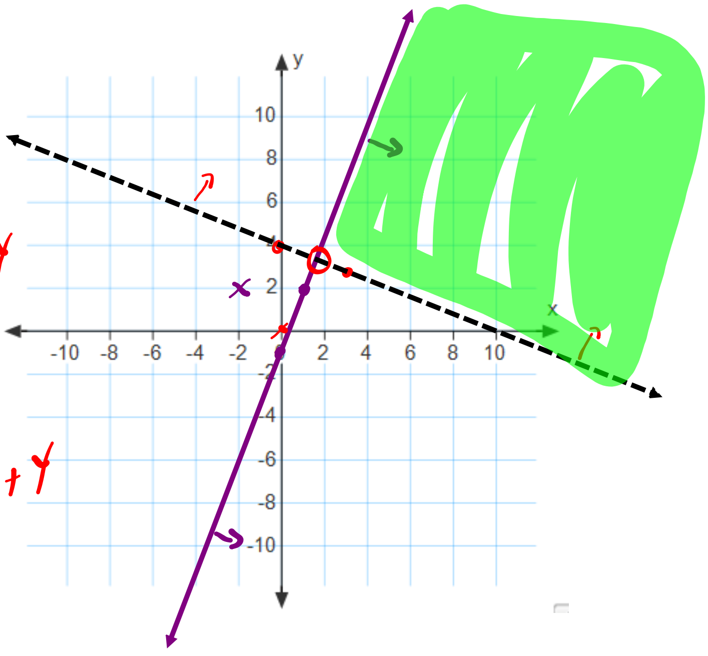
$y = 3x - 1$

Test $(-2, 2)$

LS	≤	RS
2	≤	$3(-2)-1$
		-7
		No

$y = -\frac{1}{3}x + 4$

LS	>	RS
0	>	$-\frac{1}{3}(0)+4$
		4
		No



EXAMPLE #2...

① (0,0)
② (5,2)

Graph the solution set for the following system of inequalities. Choose two possible solutions from the set.

$3x + 2y > -6$

$y \leq 3$

$y = 3$

$3x + 2y = -6$

$\frac{2y}{2} = \frac{-3x}{2} - \frac{6}{2}$

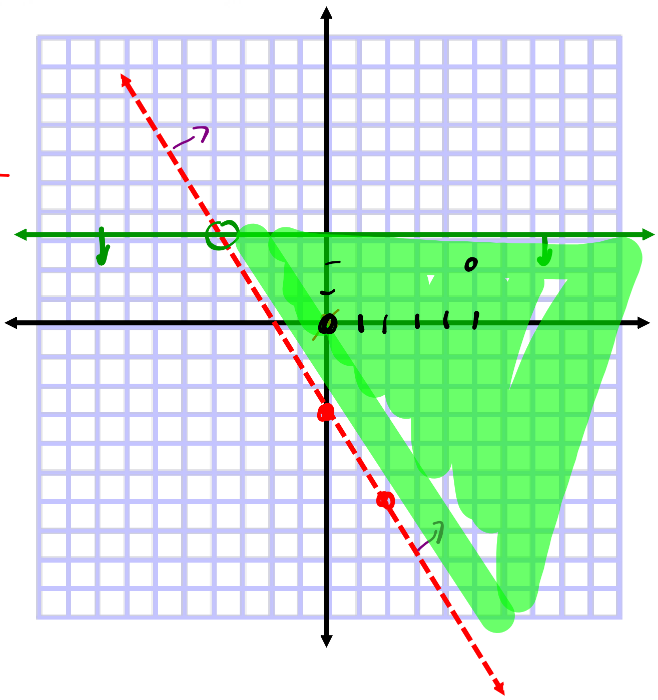
$y = -\frac{3}{2}x - 3$

LS > RS

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

0 > -6

yes



In Summary

Key Ideas

- When graphing a system of linear inequalities, the boundaries of its solution region may or may not be included, depending on the types of linear inequalities ($\geq$, $\leq$, $<$, or $>$) in the system.
- Most systems of linear inequalities representing real-world situations are restricted to the first quadrant because the values of the variables in the system must be positive.

Need to Know

- Any point in the solution region for a system is a valid solution, but some solutions may make more sense than others depending on the context of the problem.
- You can validate a possible solution from the solution region by checking to see if it satisfies each linear inequality in the system.
  For example, to validate if (2, 2) is a solution to the system:
  $x + y \geq 1$
  $2 > x - 2y$

  Validating (2, 2) for $x + y \geq 1$:

LS	RS
$x + y$	1
$2 + 2$	
4	

$4 \geq 1$ valid

  Validating (2, 2) for $2 > x - 2y$:

LS	RS
2	$x - 2y$
	$2 - 2(2)$
	-2

$2 > -2$ valid

- Use an open dot to show that an intersection point of a system's boundaries is excluded from the solution set. An intersection point is excluded when a dashed line intersects either a dashed or solid line.
- Use a solid dot to show that an intersection point of a system's boundaries is included in the solution set. This occurs when both boundary lines are solid.

HOMEWORK... p. 221 #10

Puzzle Worksheet - Systems of Linear Inequations.docx

Quiz Friday

Attachments

Puzzle Worksheet - Systems of Linear Inequations.docx