You've just had your easy exam.

The next two (and final) are harder.

For everyone who wants to do better on the next exam:

1. Get the notes printed for class, fill in the requested definitions, etc., **the night before.**

2. When you are in class, use the time to work and think. Watching me do the thinking for you doesn't help **you** learn to do or think about the math.

3. Make sure you **understand** the graded homework by first doing a practice homework or two, and then insure that you get a 100% on it. This is your buffer against disappointing exam scores, since homework is worth 20% of your final grade.

4. Resolve to yourself that you will work on your math at least 3 days a week for at least 1-2 hours each day.

   a) In order to get yourself started, promise you will work on it for 15 minutes, then put it down if it is not going well. If it didn't go well, you know to go get some help.

   b) Use the pencil rule: **If your pencil is not moving, then you are not working.** Don't kid yourself that you are working when in fact you are not.

   c) You should be spending 6 hours a week outside of class working on your homework and studying for this class. If you aren't that is the most obvious thing that needs to change.

5. Work Week-in-Review problems. Do not just come to WIR and listen to solutions; this is almost useless – you can watch me or Dr. Scarborough all day without really absorbing a thing. Do the problems, on your own or when you are there. I, naturally, have some affection for the ones I put together, but doing Dr. Scarborough's is also just as good! Solutions are posted, so even if you cannot make Week-in-Review, you can still get the solutions.

6. Work the suggested homework. All of it, or at least as much as you have time for. Resolve: I will do at least this much of each suggested homework assignment.

7. Come see me, Sydney, or the Help Sessions if you have questions, or just want some dedicated, supervised, assistance-ready time to work. There is help for you every day from Sunday through Thursday, with Sydney and I holding office hours just for our class MTuW at various times. You can come to office hours or a help session and simply sit there and work on homework. This might be a good way to get a dedicated hour or two of work in, if you need some supervision to see that you get it done.

8. Don't wait until after the test to come see someone. Put that energy in **before the next exam.**

9. Remember, the final exam is **final**. There is nothing you can do to change your grade once it is taken.

Title: Feb 14-7:04 AM (1 of 8)

http://www.gocomics.com/frazz

Section 3.1: Graphing Inequalities

Directions: Please read and outline section 3.1 before coming to class! Attempt Exercise 1, and from your book, fill in the definitions below.

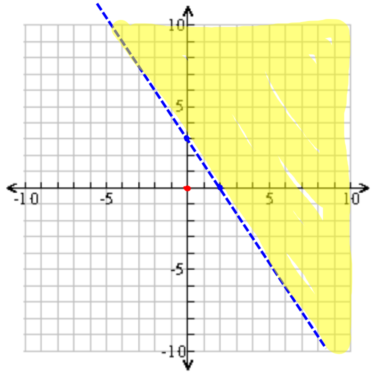
Exercise 1. We are going to graph (without our calculator) the linear inequality $3x + 2y - 6 > 0$.

$-\cancel{6>}0$

First, graph the line $3x + 2y - 6 = 0$. Use a dashed line to graph the line, since this is a strict inequality.

$3x+2y=6$

x	y
0	3
2	0



Now plug the point $(0, 0)$ into the inequality. Is the inequality true? If so, shade the side of the line that contains $(0, 0)$. Otherwise, shade the other side of the line.

$3(0)+2(0)-6<0$

You change an inequality when you multiply or divide by a negative number

$-3x \geq 9$ so I reverse inequality.

$x \leq -3$

$(-3)(-4) = 12 \geq 9$

$(-3)(-3) = 9 \geq 9$

$(-3)(-2) = 6 \leq 9$

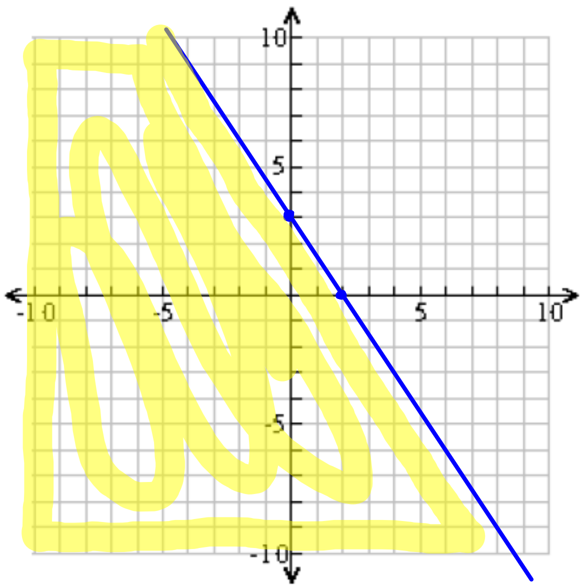
Definition. Procedure for graphing linear inequalities

1. Draw the graph of the equation obtained for the given inequality by replacing the inequality sign with an equal sign. Use a dashed or dotted line if the problem involves a strict inequality $<$ or $>$. Otherwise, use a solid line to indicate that the line itself constitutes part of the solution.
2. Pick a test point (a, b) in one of the half-planes determined by the line sketched in Step 1 and substitute the numbers a and b for the values of x and y in the given inequality. For simplicity, use the origin whenever possible.
3. If the inequality is satisfied, the graph of the solution to the inequality is the half-plane containing the test point. Otherwise, the solution is the half-plane **not** containing the test point.

$3x + 2y - 6 > 0$ (before)

Exercise 2. Using your work on Exercise 1, graph $3x + 2y - 6 \leq 0$.

x	y
0	3
2	0



The reason we are going to graph inequalities today is because what we want to learn is how to solve **linear programming problems**.

Definition. linear programming problem
A **linear programming problem** consists of a linear function to be **maximized or minimized** subject to a set of constraints in the form of a system of linear equations or inequalities.

Definition. feasible region (FR)
The **feasible region (FR)**, sometimes called the **solution set**, for a system of inequalities is the set of points that satisfies all of the inequalities at the same time. The feasible region is usually illustrated graphically in the xy-plane.

Exercise 3. Sketch the feasible region for these inequalities (system of inequalities).

$$\begin{array}{rcrcl} 3x & + & 2y & \leq & 16 \\ x & - & y & \leq & 2 \\ & & x,\ y & \geq & 0 \end{array}$$

$x \geq 0$ and $y \geq 0$

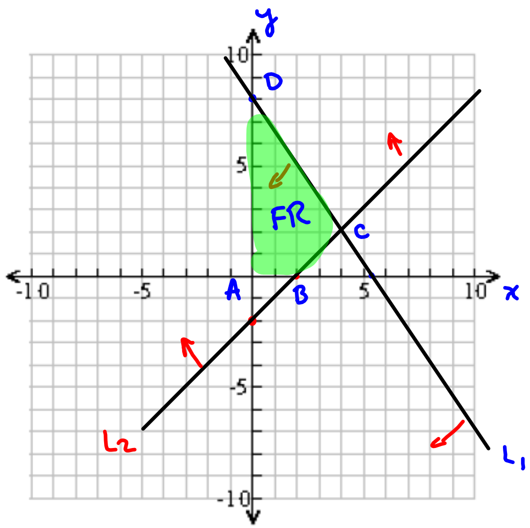
$3x+2y=16$ L_1

x	y
0	8
$\frac{16}{3}$	0

$\frac{16}{3} = 5\frac{1}{3}$

$x-y=2$ L_2

x	y
2	0
0	-2



$x-y \leq 2$

$-y \leq 2-x$

$y \geq -2+x$

$0 \geq -2+0$ True? yes!

Definition. bounded and unbounded solution sets
The solution set of a system of linear inequalities is **bounded** if it can be enclosed in a circle. Otherwise it is **unbounded**

Definition. corner points
The intersection of two inequalities (if it exists), is called a **corner point** of the feasible region (or solution set), provided that this point is part of the feasible region.

Exercise 4. Find all the corner points for the system of inequalities we graphed in Exercise 3.

$$\begin{array}{rcrcl} 3x & + & 2y & \leq & 16 \\ x & - & y & \leq & 2 \\ & & x,\ y & \geq & 0 \end{array}$$

A (0,0)
B (2,0)
C (4,2)
D (0,8)

C: intersect

$3x+2y=16$
$2(\ x-y=2) \rightarrow 2x-2y=4$

$3x+2y=16$

$5x = 20$
$x = 4$

$4-y=2$
$y=2$

$4-2=y$
$2=y$

$4-y=2$
$-2\ +y \quad -2\ +y$

$4-2=y$

Exercise 5. Sketch the feasible region and find all the corner points for

$$\begin{array}{rcrcr} x & + & y & \le & 2 \\ 3x & + & y & \ge & 6 \\ x & + & 3y & \ge & 6 \end{array}$$

$x+y=2$

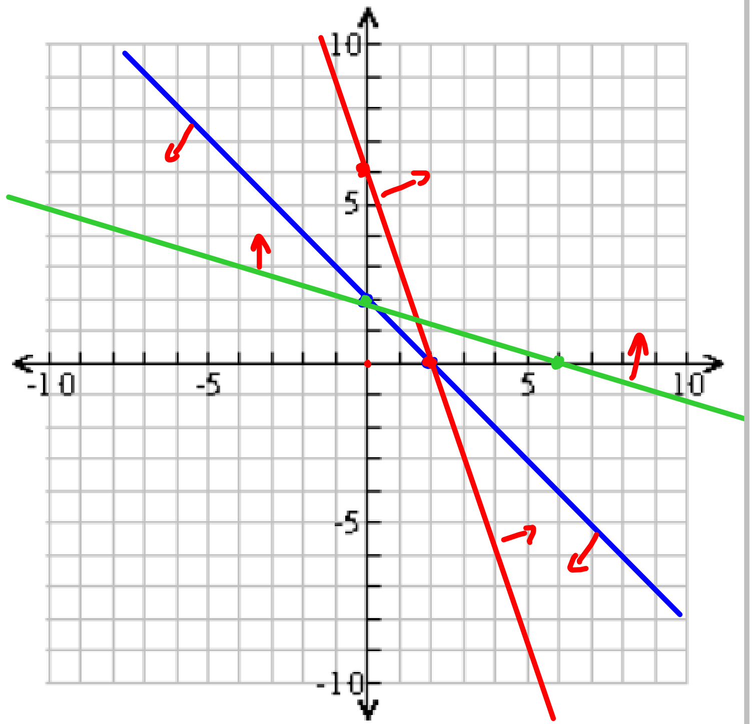
x	y
0	2
2	0

$3x+y=6$

x	y
0	6
2	0

$x+3y=6$

x	y
0	2
6	0



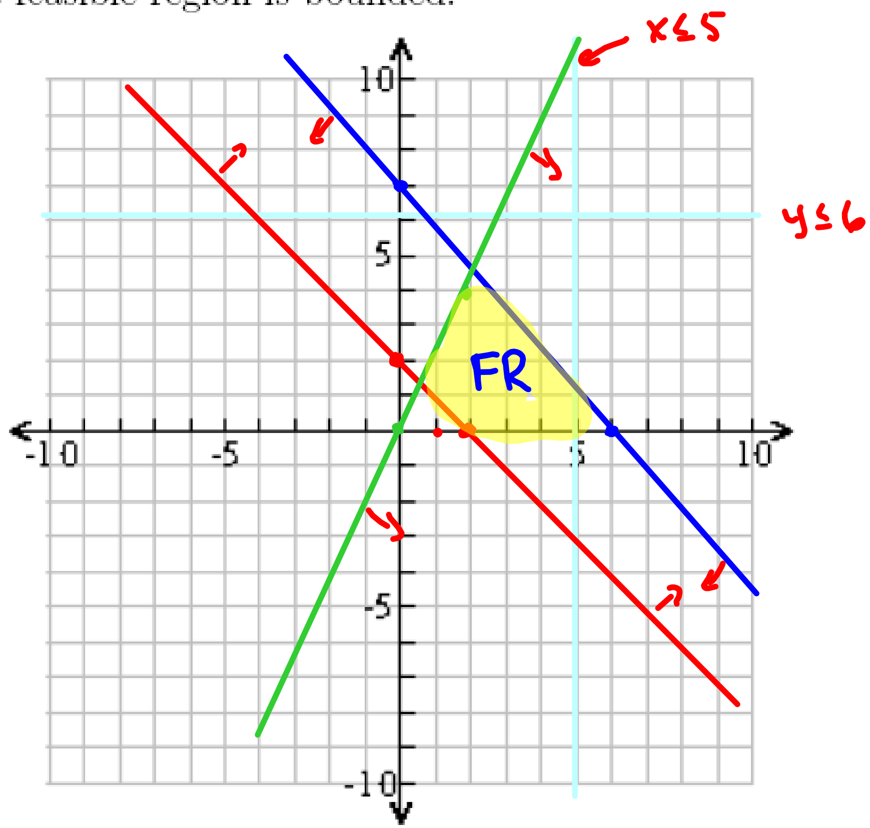
Is this feasible region bounded?

No Feasible Region

Bounded does not apply.

Exercise 6. Determine the feasible region for this system of inequalities. Find all corner points and determine if the feasible region is bounded.

$$\begin{aligned} x + y &\le 6 \\ x + y &\ge 2 \\ 2x - y &\ge 0 \quad (1,0) \\ x &\le 5 \\ y &\le 6 \\ x,\ y &\ge 0 \end{aligned}$$



$x+y=6$

x	y
0	6
6	0

$x+y=2$

x	y
0	2
2	0

IS BOUNDED

$2x-y=0$

x	y
0	0
2	4

Exercise 7. Determine the feasible region for this system of inequalities. Find all corner points and determine if the feasible region is bounded.

$$\begin{aligned} x + y &\le 6 \\ x + y &\ge 2 \end{aligned}$$

$x+y=6$

x	y
0	6
6	0

$\boxed{x+y=2}$

x	y
0	2
2	0

Unbounded