

Unit 8 Target Date:

Name: _____

Unit 8

Linear Functions

Topics

☐ 8.1 - Slope of a Line

Initials:

☐ 8.2 - Graphing Lines

Checkpoint:

☐ 8.3 - Horizontal & Vertical Lines

☐ 8.4 - Writing Equations of Lines

☐ 8.5 - Graphing Linear Inequalities

Checkpoint:

☐ Unit 8 Flashcards + Review + Point Problems

Flashcards + Review:

Vocabulary Flashcards

☐ (8.1) Slope (verbal definition)

☐ (8.2) Intercept

☐ (8.1) Slope formula

☐ (8.2) y-intercept

☐ (8.1) Hiker dude

☐ (8.2) x-intercept

☐ (8.1) Positive slope

☐ (8.2) Process for graphing lines

☐ (8.1) Negative slope

☐ (8.3) Horizontal line

☐ (8.1) Zero slope

☐ (8.3) Vertical line

☐ (8.1) Undefined slope

☐ (8.3) Equation of a horizontal line

☐ (8.2) Slope-intercept form

☐ (8.3) Equation of a vertical line

☐ (8.2) m

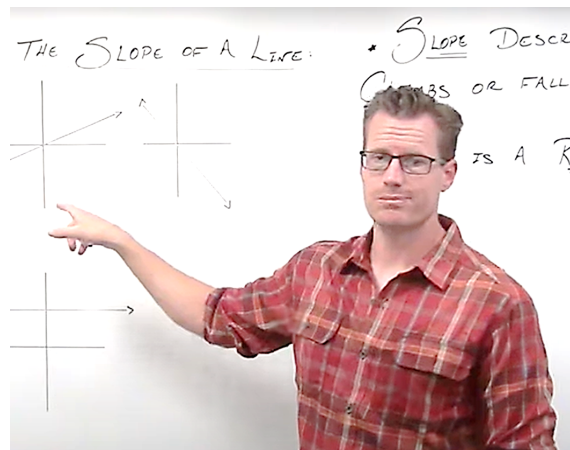
☐ (8.4) To find the equation of a line, we need:

☐ (8.2) b

☐ (8.5) How to shade graphs of linear inequalities



– When you see this symbol, make a flashcard.



When math teachers try to be cool:
"Slope is dope."

Notes:

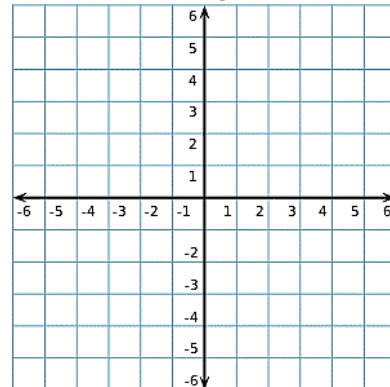
Let's talk about _____ on the x-y plane, like this one:

How would you describe this line to a friend? You might tell your

friend: 1) _____

2) _____

3) _____



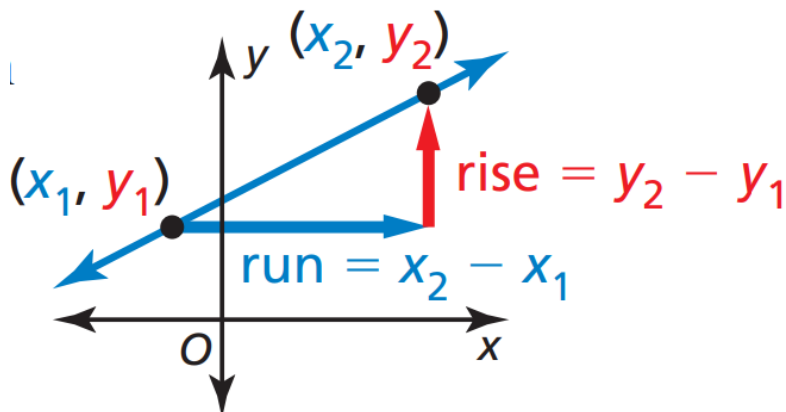
We will get to #1 later, but for now, _____ can be used to describe #2 and #3.

**SLOPE**

The _____ of a line passing through two points _____ and _____

is the ratio of the _____ (change in y) over the _____ (change in x).

Slope =



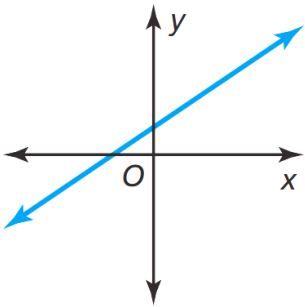
 Please allow me introduce you to _____.



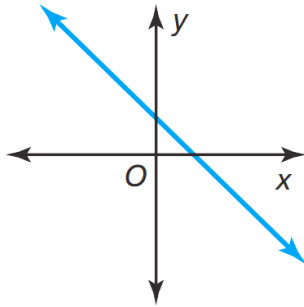
8.1

He will help us learn that slope can be:

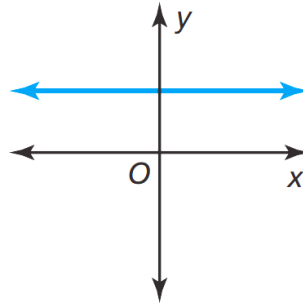
 _____  _____  _____  _____



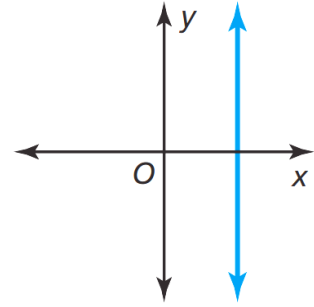
The line rises
from left to right.



The line falls
from left to right.



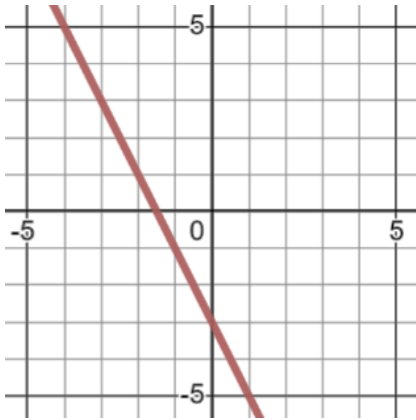
The line is
horizontal.



The line
is vertical.

Describe the slope of each line (rising, falling, horizontal or vertical). Then find the slope (m).

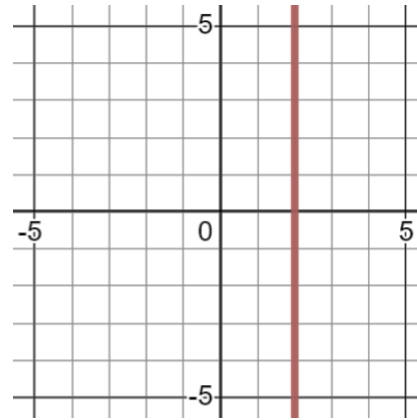
1)



Describe: _____

Slope (m):

2)

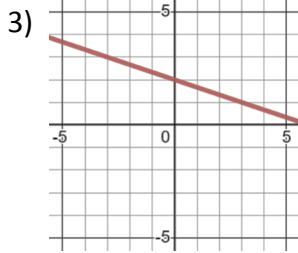




Your turn. Stop the video and complete the following problems. Then turn the video back on to check your solutions.

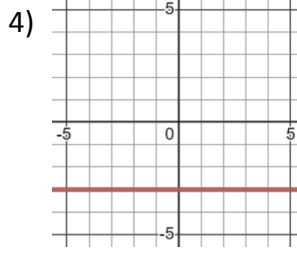
8.1

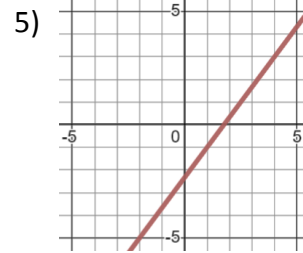
Describe the slope of each line (rising, falling, horizontal or vertical). Then find the slope (m).



Describe: _____

Slope (m): _____





We also need to be prepared for these problems:

6) Find the slope given two points on a line:

$(-5, 2)$ and $(-8, -2)$

7) Find the slope from a table:

x	-3	-1	1	3
y	11	3	-5	-13



Your turn. Stop the video and complete the following problems. Then turn the video back on to check your solutions.

8) Find the slope given two points on a line:

$(-3, -5)$ and $(5, -7)$

9) Find the slope from a table:

x	y
2	-5
2	-2
2	1
2	4
2	7

8.1

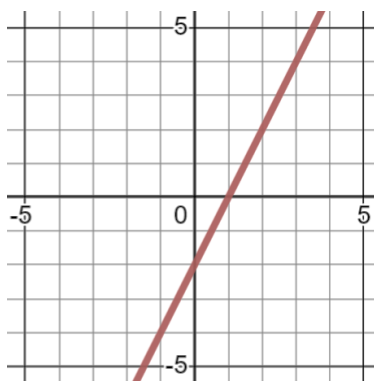
This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is a small black rectangular mark at the top center of the page. The paper is otherwise blank, with no text or other markings.

Are you ready to explain the main ideas to one of us? When you are ready, call one of us over.
Time for some practice...

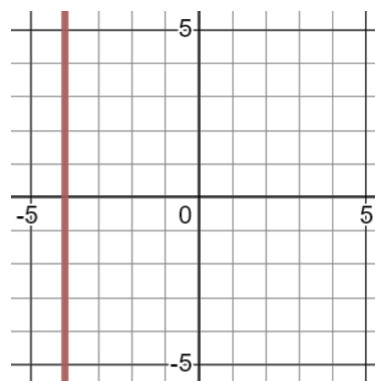
8.1

Find the slope of the following lines:

1)



2)

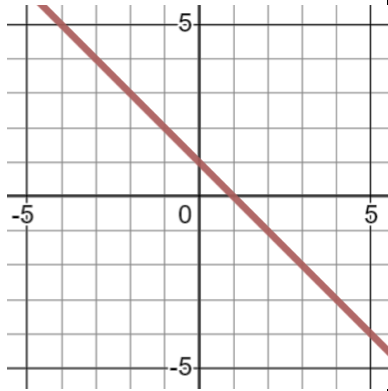


3) Find the slope of the line that passes through:
 $(-2, 8)$ and $(5, 8)$

4)

x	-3	-1	1	3
y	11	3	-5	-13

5)



6)

x	-9	-5	-1	3
y	-2	0	2	4

Solutions (no peeking):

8.1

1) $m = 2$

2) Undefined

3) $m = 0$

4) $m = -4$

5) $m = -1$

6) $m = \frac{1}{2}$

Joke:

What's the most popular shape at Great America?
The line [to Raging Bull].

Notes:

⚡ Let's start by graphing lines using _____, which

looks like this:

Slope-Intercept Form

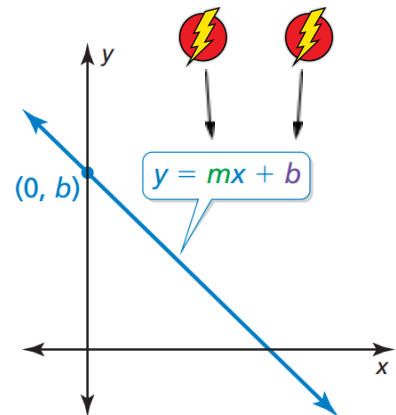
Words A linear equation written in the form $y = mx + b$ is in **slope-intercept form**. The slope of the line is m , and the y-intercept of the line is b .

Algebra

$$y = mx + b$$

slope

y-intercept



We have talked about slope (m) already, but let's talk about the _____.

⚡ In this context the verb _____ means _____.

⚡ The y-intercept is where the line _____. This is the _____ above.

⚡ While we are at it, let's talk about the _____. The x-intercept is where the line _____.

⚡ Let's graph some lines using the following process:

1. Rewrite the equation in slope-intercept form _____, if necessary.

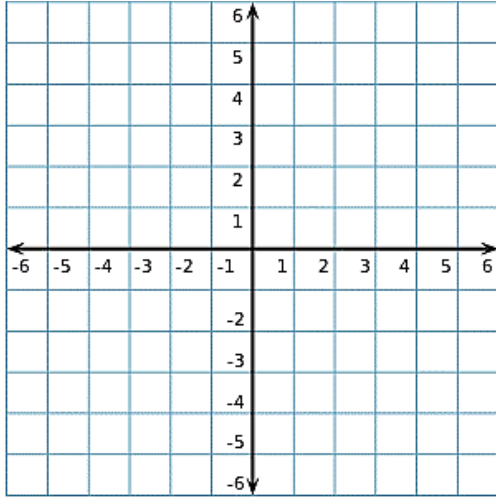
You can do this by getting _____.

2. Plot the _____ using the _____.

3. "Plot" the _____ (rise over run) using the _____ written as a _____.

4. Use a _____ to draw the line.

1) a) Graph the line: $y = 2x - 4$

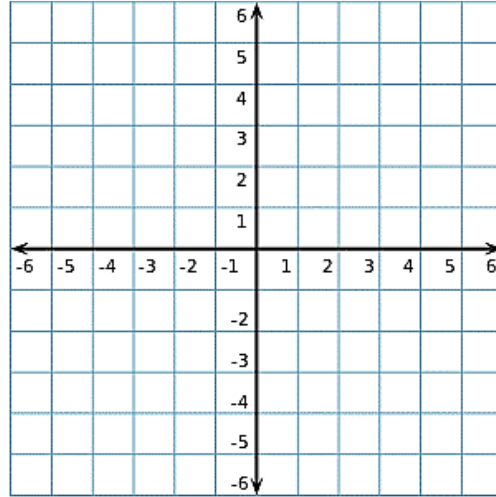


b) The slope is: _____

c) The x-intercept is: _____

d) The y-intercept is: _____

2) a) Graph the line: $y = -\frac{1}{3}x$



b) The slope is: _____

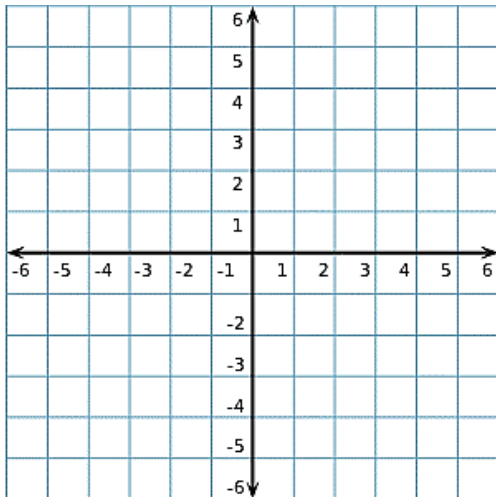
c) The x-intercept is: _____

d) The y-intercept is: _____



Your turn. Stop the video and complete the following problems. Then turn the video back on to check your solutions.

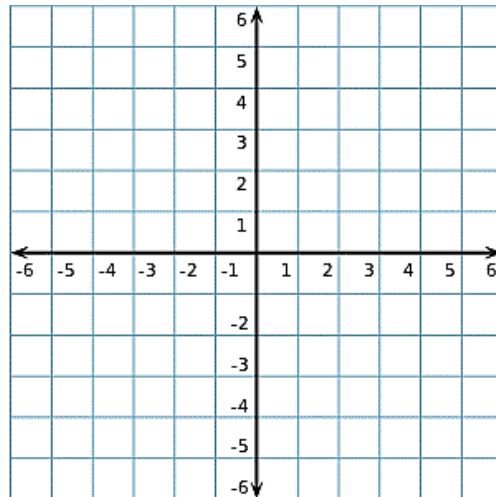
3) a) Graph the line: $y = \frac{5}{2}x$



b) The slope is: _____

c) The x-intercept is: _____

4) a) Graph the line: $y = -3x + 6$



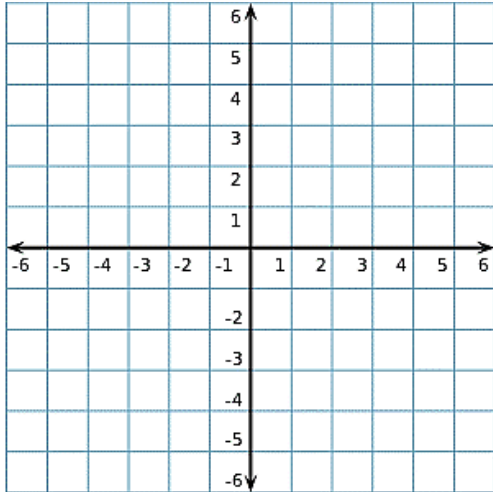
b) The slope is: _____

c) The x-intercept is: _____

d) The y-intercept is: _____

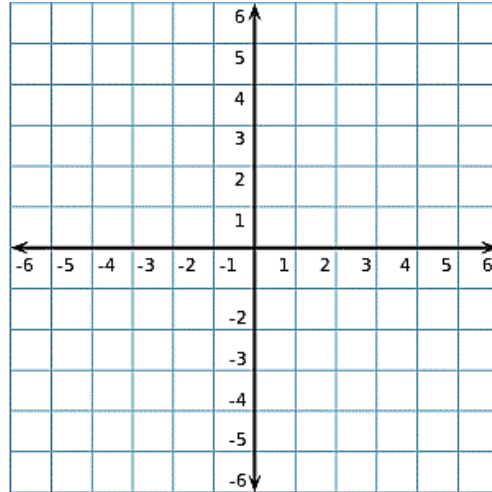
Okay, let's try graphing some harder problems.

5) Graph the line: $-x + y = 3$



d) The y-intercept is: _____

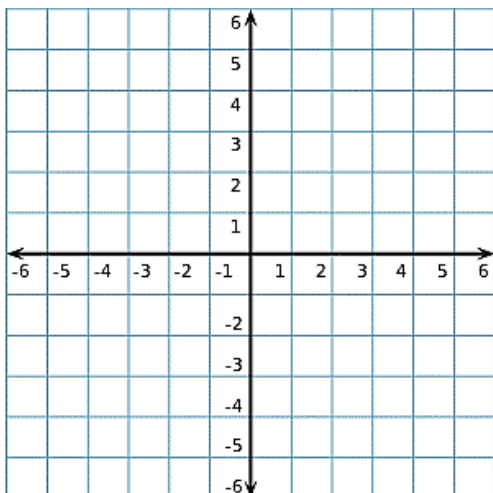
6) Graph the line: $2x - 3y = 12$



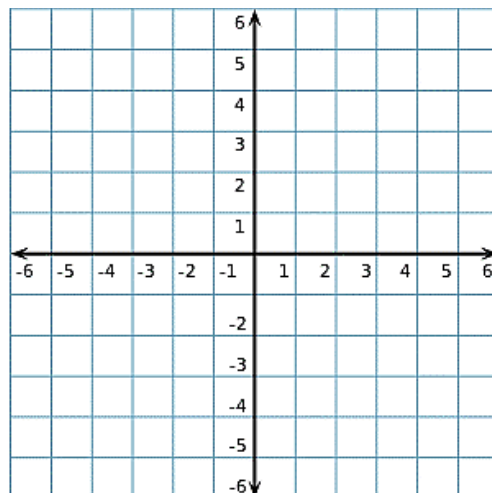
Your turn. Stop the video and complete the following problems. Then turn the video back on to check your solutions.

8.2

7) Graph the line: $x + 2y = 6$



8) Graph the line: $3x - 2y = 6$



8.2

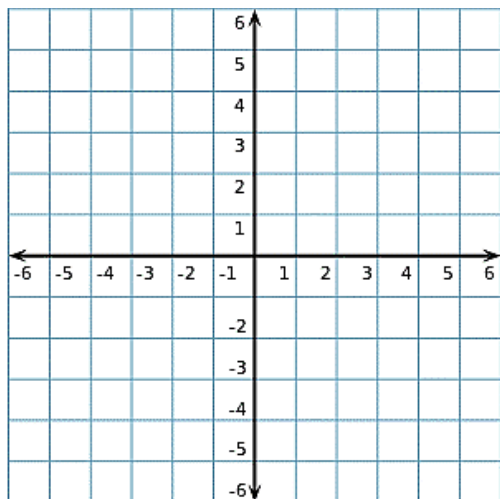
A black and white photograph of a street sign. The sign is rectangular with a black background and white, bold, sans-serif capital letters that read "MAIN STREET". It is mounted on a black metal post. The sign is slightly tilted to the right. The background is a plain, light-colored wall.This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is a small black rectangular mark at the top center of the page. The paper is otherwise blank, with no text or other markings.



Are you ready to explain the main ideas to one of us? When you are ready, call one of us over.
Time for some practice...

8.2

1) a) Graph the line: $y = -2x + 2$

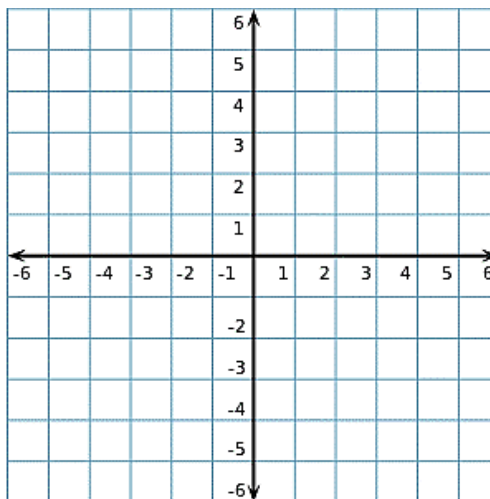


b) The slope is: _____

c) The x-intercept is: _____

d) The y-intercept is: _____

2) a) Graph the line: $y = \frac{2}{3}x - 4$

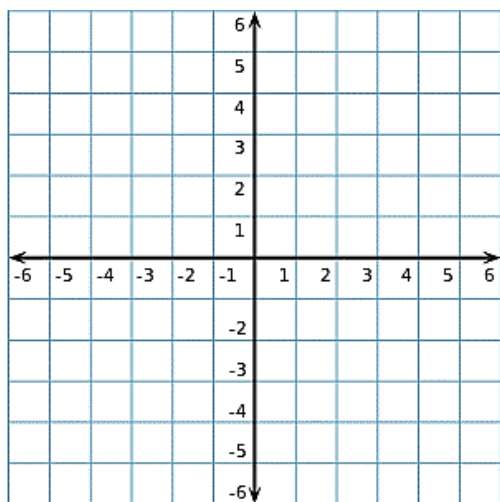


b) The slope is: _____

c) The x-intercept is: _____

d) The y-intercept is: _____

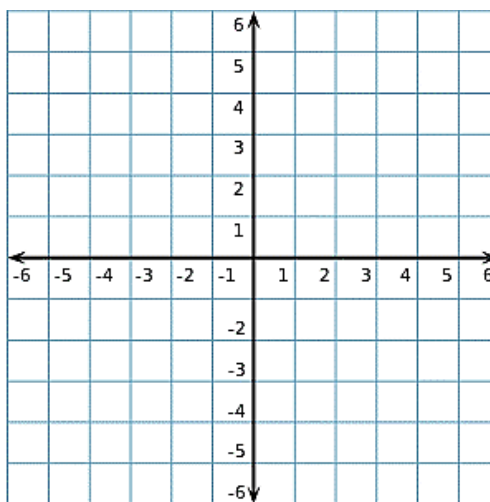
3) a) Graph the line: $y = -\frac{1}{3}x - 2$



b) The slope is: _____

c) The x-intercept is: _____

4) a) Graph the line: $y = -2x$

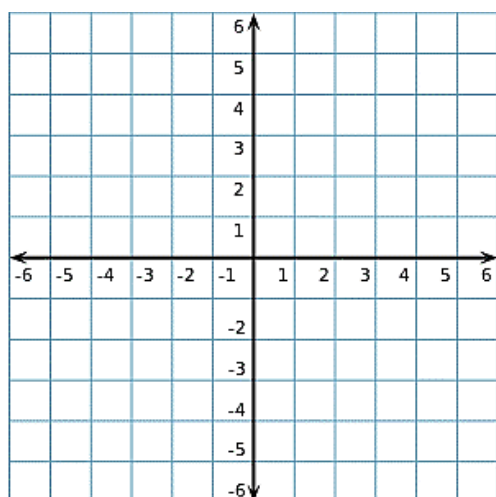


b) The slope is: _____

c) The x-intercept is: _____

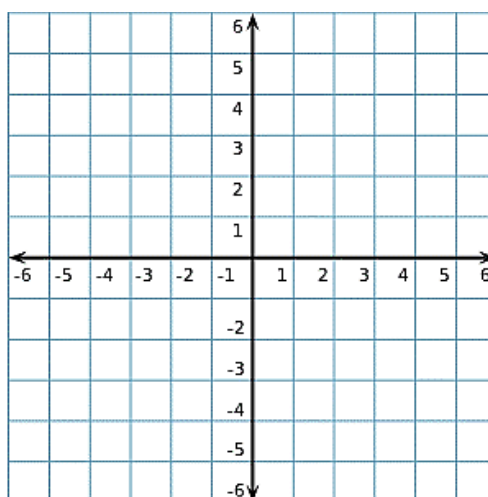
d) The y-intercept is: _____

5) Graph the line: $-4x + y = 1$



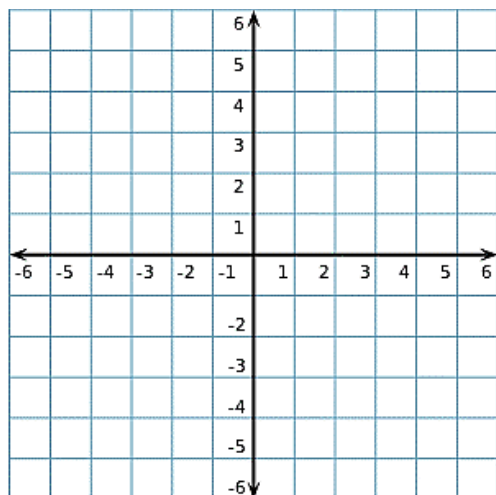
d) The y-intercept is: _____

6) Graph the line: $x + 3y = 6$

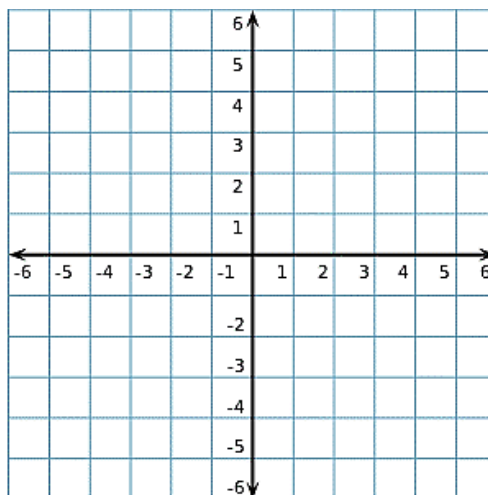


8.2

7) Graph the line: $4x - 2y = 6$



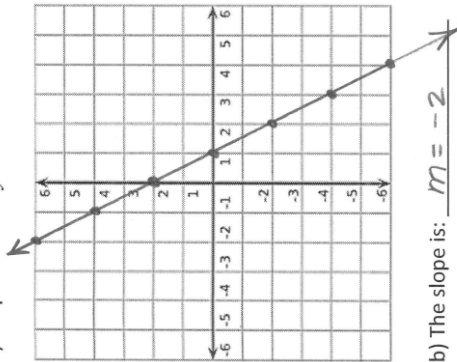
8) Graph the line: $-x - y = 5$



Solutions for Page 11:

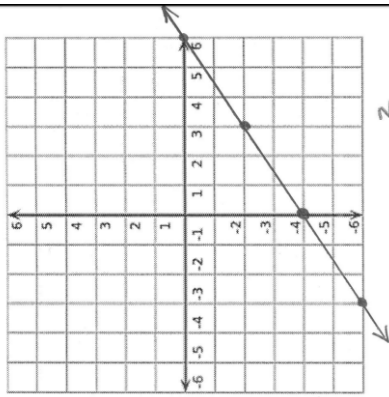
Solutions (no peeking):

- 1) a) Graph the line: $y = -2x + 2$



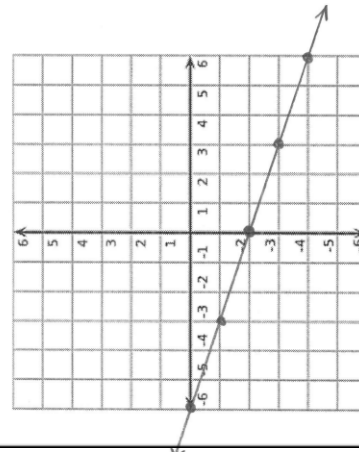
- b) The slope is: $m = -2$
 c) The x-intercept is: $x = 1$
 d) The y-intercept is: $y = 2$

- 2) a) Graph the line: $y = \frac{2}{3}x - 4$



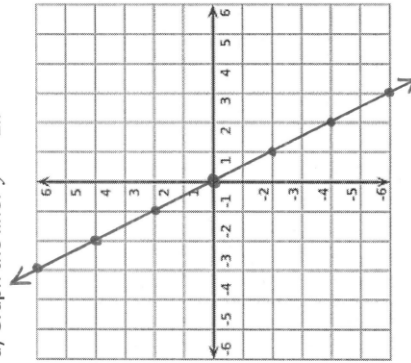
- b) The slope is: $m = \frac{2}{3}$
 c) The x-intercept is: $x = 6$
 d) The y-intercept is: $y = -4$

- 3) a) Graph the line: $y = -\frac{1}{3}x - 2$



- b) The slope is: $m = -\frac{1}{3}$
 c) The x-intercept is: $x = -6$
 d) The y-intercept is: $y = -2$

- 4) a) Graph the line: $y = -2x$

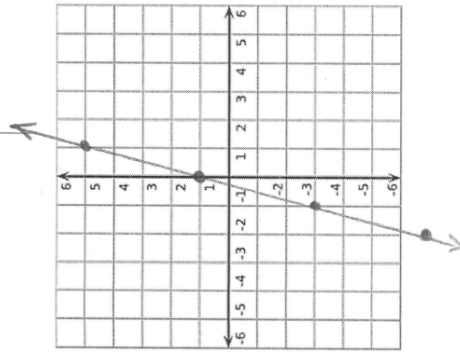


- b) The slope is: $m = -2$
 c) The x-intercept is: $x = 0$
 d) The y-intercept is: $y = 0$

Solutions for Page 12:

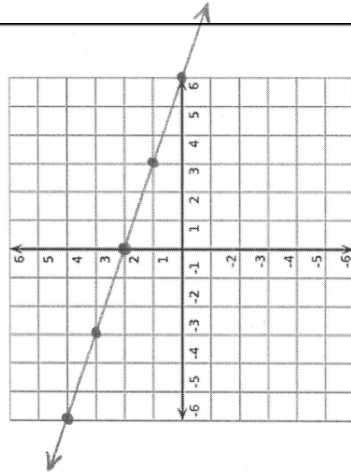
5) Graph the line: $4x + y = 1$

$$\begin{array}{r} 4x + y = 1 \\ -4x \\ \hline y = 1 - 4x \\ (m) \quad (b) \end{array}$$



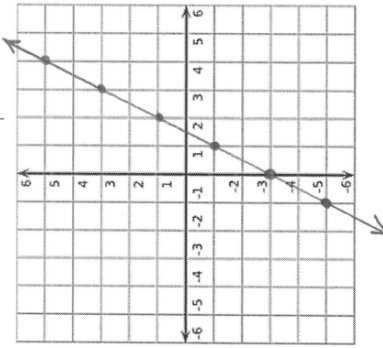
6) Graph the line: $x + 3y = 6$

$$\begin{array}{r} x + 3y = 6 \\ -x \\ \hline 3y = -x + 6 \\ y = -\frac{1}{3}x + 2 \\ (m) \quad (b) \end{array}$$



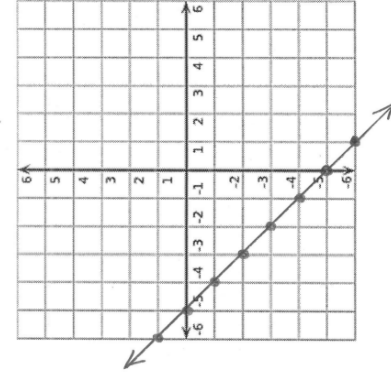
7) Graph the line: $4x - 2y = 6$

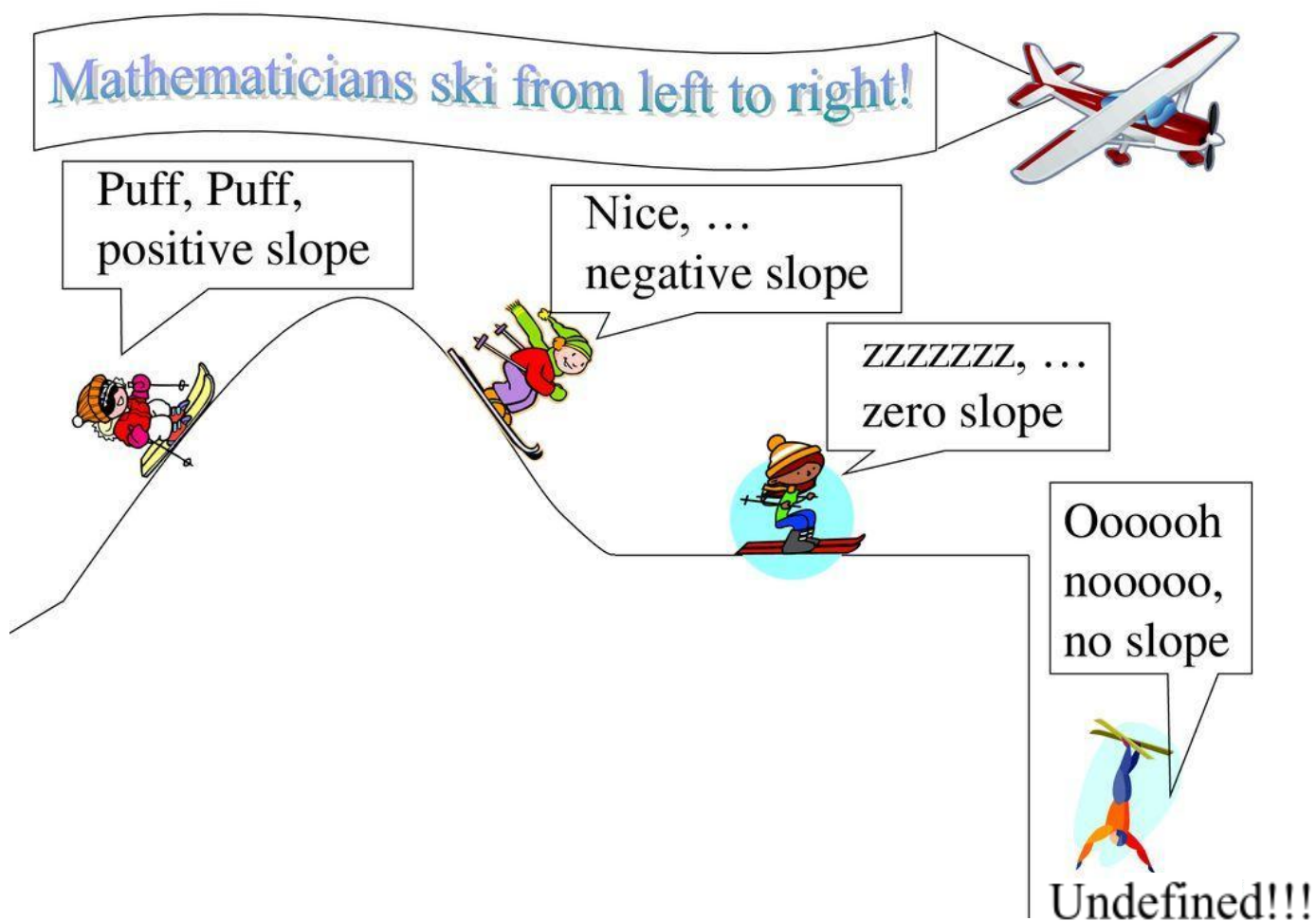
$$\begin{array}{r} 4x - 2y = 6 \\ -4x \\ \hline -2y = -4x + 6 \\ y = 2x - 3 \\ (m) \quad (b) \end{array}$$



8) Graph the line: $x - y = 5$

$$\begin{array}{r} x - y = 5 \\ -x \\ \hline -y = -x + 5 \\ y = x - 5 \\ (m) \quad (b) \end{array}$$



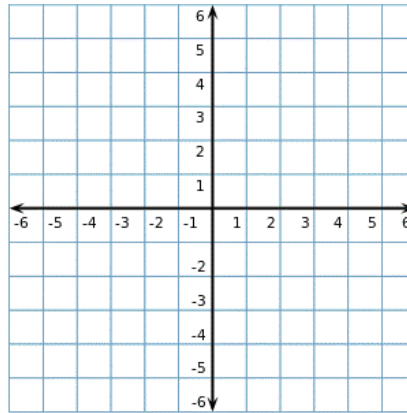


Notes:

Warm-up:



- 1) Draw a horizontal line that passes through the y-axis at $y = 3$.
- 2) Draw a vertical line that passes through the x-axis at $x = -4$.



Let's analyze both of these lines...

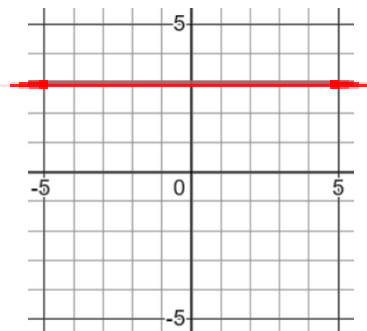
When we studied relations and functions in Unit 7, we learned that a _____

consists of millions and billions and zillions of _____ that are super close to each other.

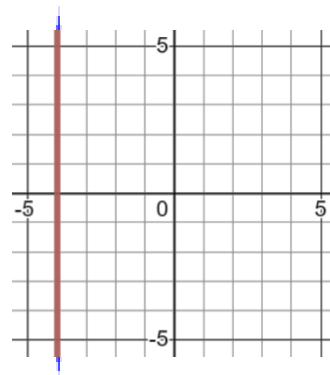
And that every single one of those points _____ .

Let's think...

1. For the horizontal line to the right, can you think of an equation that would be true for every single point on the line?



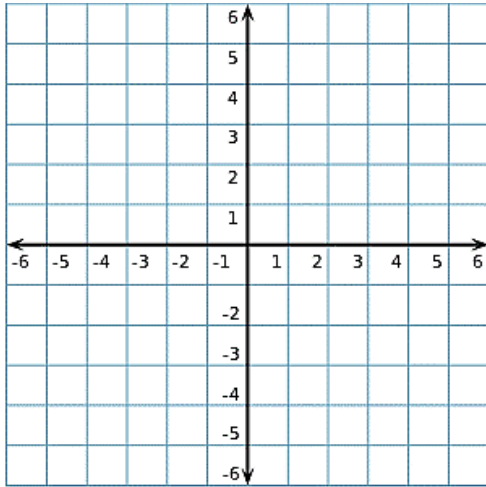
2. For the vertical line to the right, can you think of an equation that would be true for every single point on the line?



8.3

Let's do some examples...

1) a) Graph the line: $y = -6$

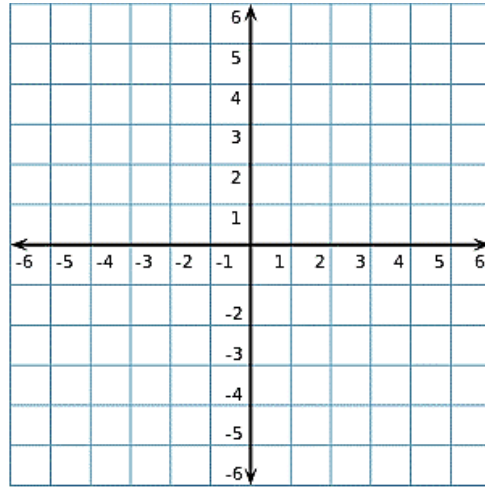


b) The slope is: _____

c) The x-intercept is: _____

d) The y-intercept is: _____

2) a) Graph the line: $x = 0$



b) The slope is: _____

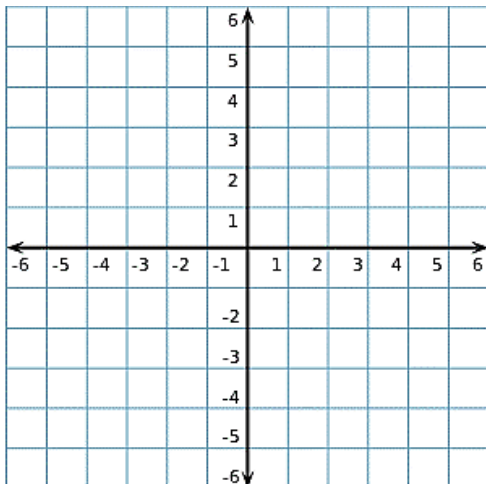
c) The x-intercept is: _____

d) The y-intercept is: _____



Your turn. Stop the video and complete the following problems. Then turn the video back on to check your solutions.

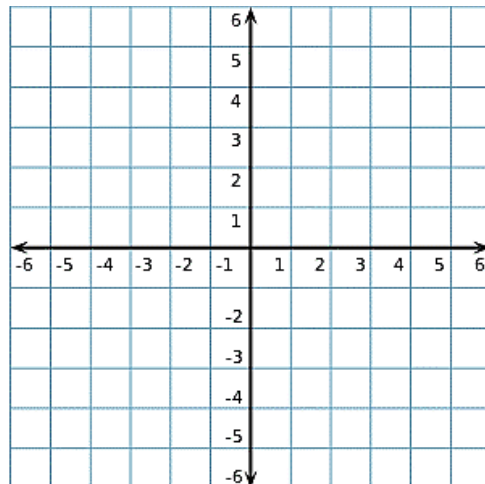
3) a) Graph the line: $x = 2$



b) The slope is: _____

c) The x-intercept is: _____

4) a) Graph the line: $y = 0$



b) The slope is: _____

c) The x-intercept is: _____

d) The y-intercept is: _____
You might be wondering...

d) The y-intercept is: _____

8.3

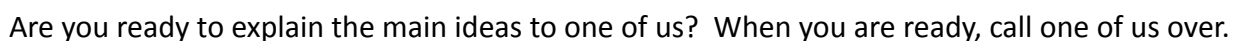
Why are we spending an entire topic on a concept that seems so easy? The answer is:

1. It's very easy to _____ x and y when doing these problems. For example, you might think that the equation _____ should go left and right because the x-axis goes left and right. But _____ is actually a vertical line.
2. When you see equations like _____ or _____, you might think about the solution to an equation (from Unit 5) and not the equation of a line. So you can get faked out.
3. When graphing lines, your brain is so focused on _____ that you can forget about these _____.

Joke:

As Mr. Behling gets closer and closer to retirement, he's more and more worried about the aftermath.

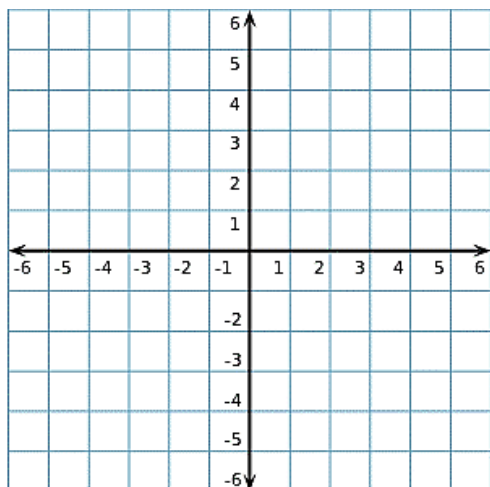
8.3

A black and white photograph of a street sign. The sign is rectangular with a black background and white, bold, sans-serif capital letters that read "MAIN STREET". The sign is mounted on a black metal post. The background is a plain, light-colored wall.This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

Time for some practice...

8.3

1) a) Graph the line: $y = 4$

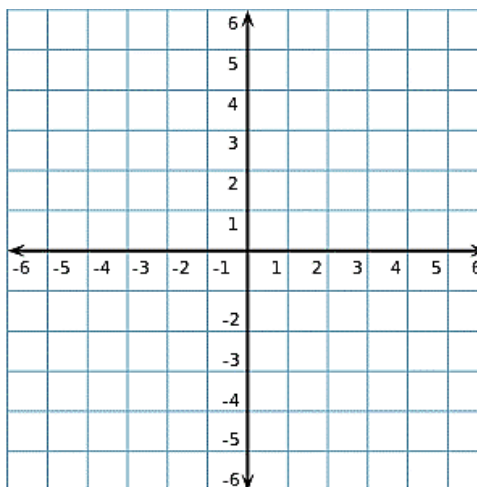


b) The slope is: _____

c) The x-intercept is: _____

d) The y-intercept is: _____

2) a) Graph the line: $y = -\frac{1}{2}x + 3$

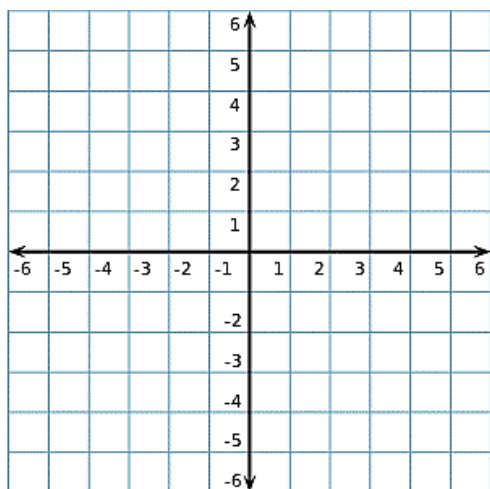


b) The slope is: _____

c) The x-intercept is: _____

d) The y-intercept is: _____

3) a) Graph the line: $y = 4x - 4$

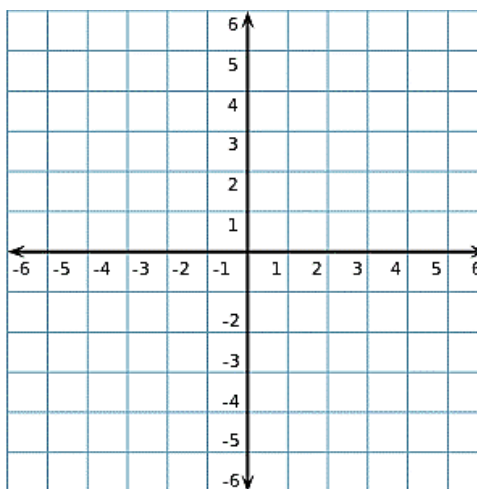


b) The slope is: _____

c) The x-intercept is: _____

d) The y-intercept is: _____

4) a) Graph the line: $x = -1$

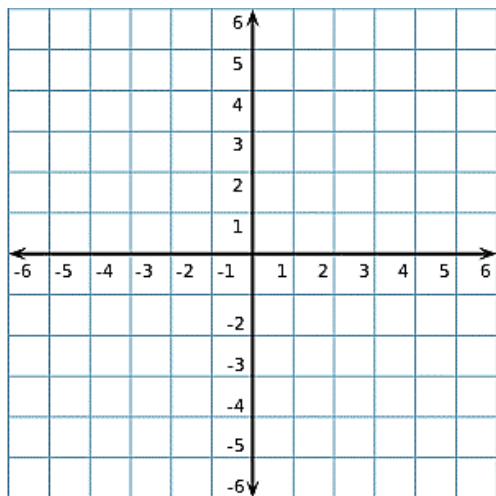


b) The slope is: _____

c) The x-intercept is: _____

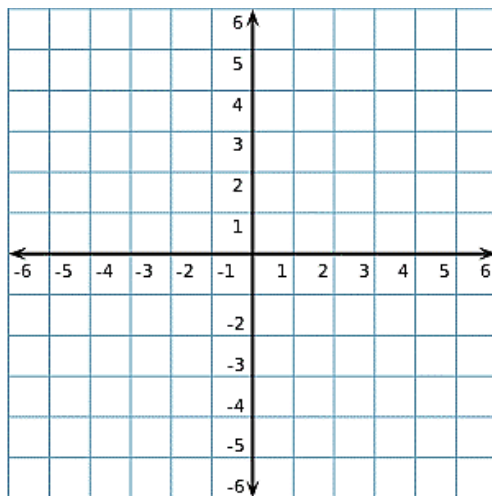
d) The y-intercept is: _____

5) Graph the line: $-3x + 2y = 4$

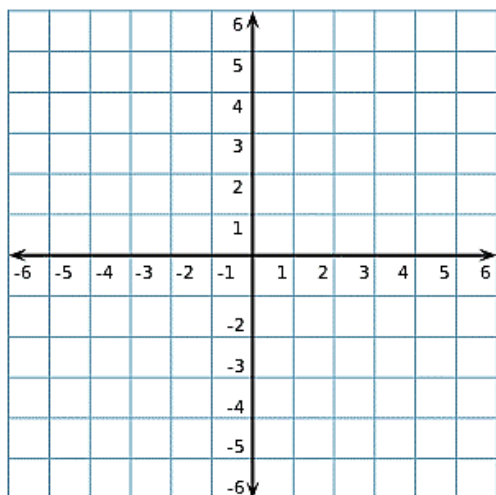


6) Graph the line: $x = 0$

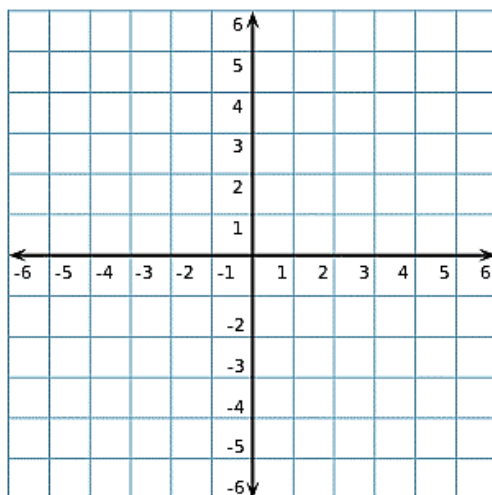
8.3



7) Graph the line: $-x + y = 5$

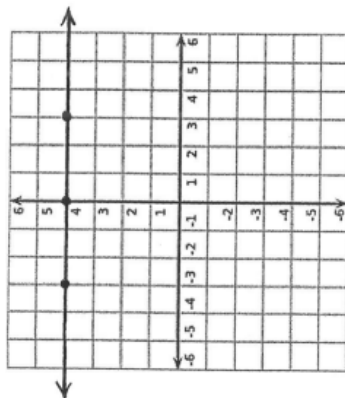


8) Graph the line: $2x - y = 5$



Solutions for Page 20:

1) a) Graph the line: $y = 4$

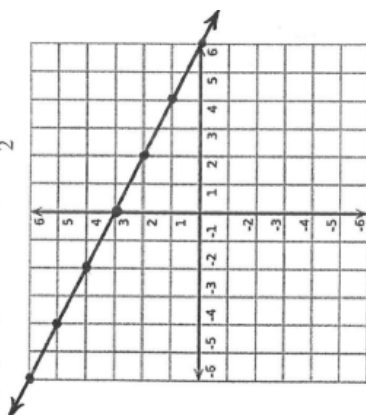


b) The slope is: $m = 0$

c) The x-intercept is: *None*

d) The y-intercept is: $y = 4$

2) a) Graph the line: $y = -\frac{1}{2}x + 3$

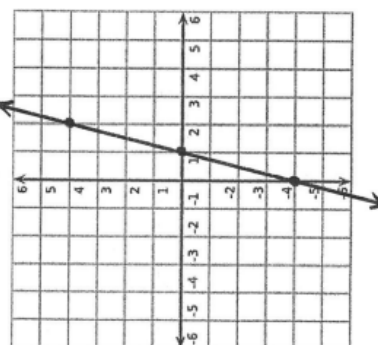


b) The slope is: $m = -\frac{1}{2}$

c) The x-intercept is: $x = 6$

d) The y-intercept is: $y = 3$

3) a) Graph the line: $y = 4x - 4$

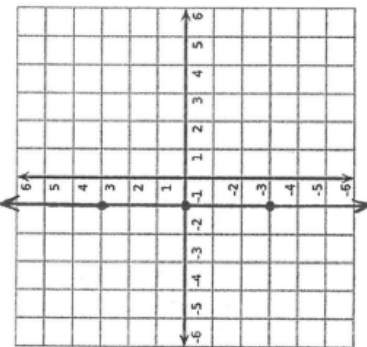


b) The slope is: $m = 4$

c) The x-intercept is: $x = 1$

d) The y-intercept is: $y = -4$

4) a) Graph the line: $x = -1$



b) The slope is: *Undefined*

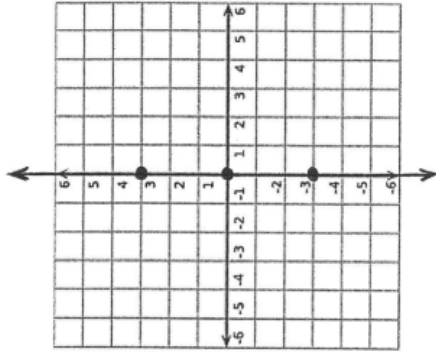
c) The x-intercept is: $x = -1$

d) The y-intercept is: *None*

Solutions for Page 21:

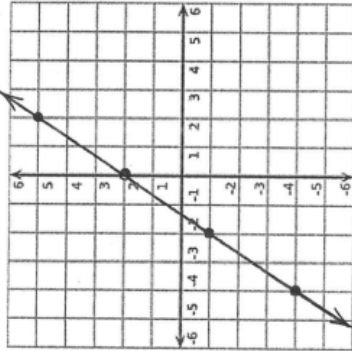
6) Graph the line: $x = 0$

Vertical line at $x = 0$.



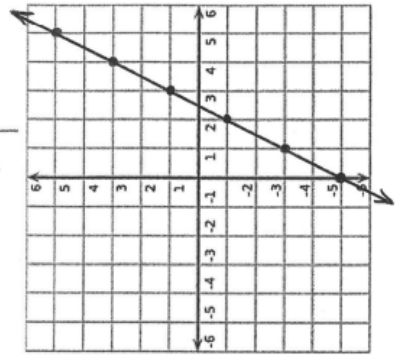
5) Graph the line: $-3x + 2y = 4$

$$\begin{aligned} -3x + 2y &= 4 \\ +3x & \\ \hline 2y &= 3x + 4 \\ \frac{2y}{2} &= \frac{3x + 4}{2} \\ y &= \frac{3}{2}x + 2 \end{aligned}$$



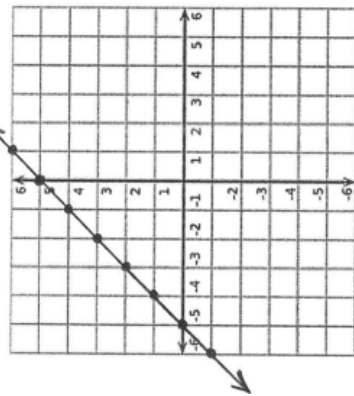
8) Graph the line: $2x - y = 5$

$$\begin{aligned} 2x - y &= 5 \\ -2x & \\ \hline -y &= -2x + 5 \\ \frac{-y}{-1} &= \frac{-2x + 5}{-1} \\ y &= 2x - 5 \end{aligned}$$



7) Graph the line: $-x + y = 5$

$$\begin{aligned} -x + y &= 5 \\ +x & \\ \hline y &= x + 5 \end{aligned}$$



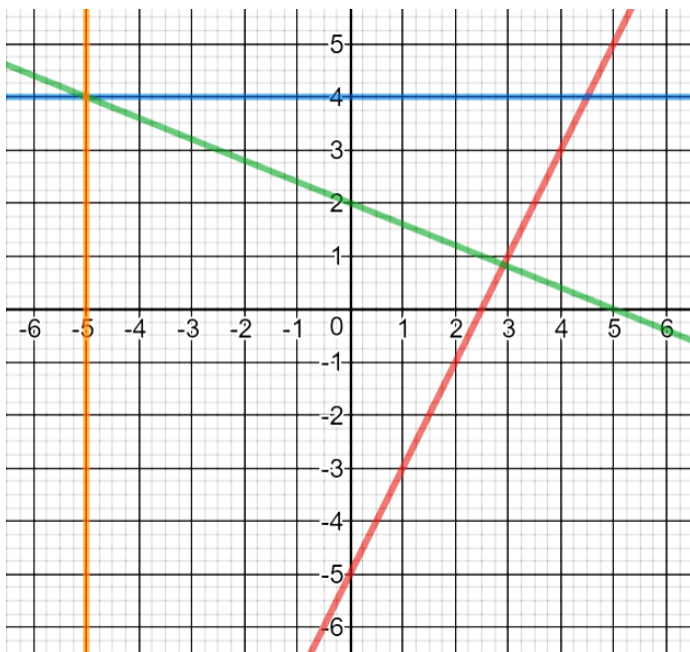
Algebra Essentials, Unit 8

8.4 - Writing Equations of Lines

Notes:

You know that Mr. Behling loves _____ problems.

Let's do some "backward" problems... But first a warm-up:



1) Which line has a positive slope?

Blue / Green / Yellow / Red

2) Which line has a negative slope?

Blue / Green / Yellow / Red

3) Which line has a zero slope?

Blue / Green / Yellow / Red

4) Which line has an undefined slope?

Blue / Green / Yellow / Red

For a “backward” problem, we are given the graph of a _____ or the description of a _____ and we need to find the _____.

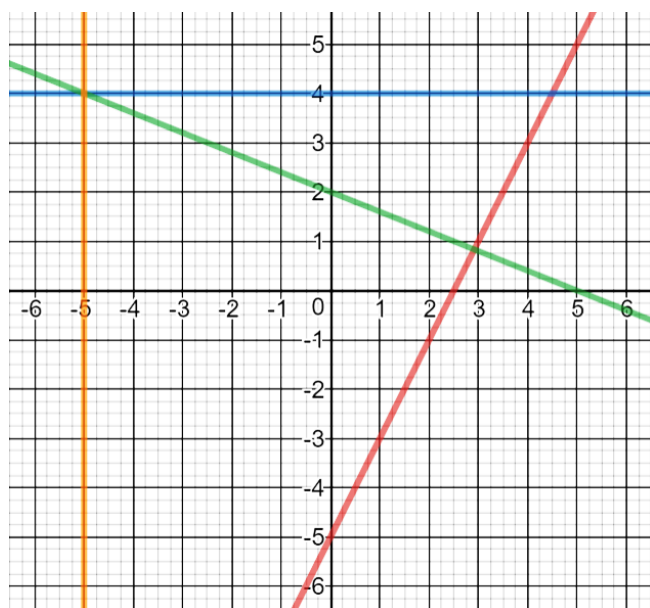
To do this, let’s first recall slope-intercept form:



To find the equation of a line (_____) that is not horizontal or vertical, we need to know:

1. The _____ of the line. This will be our _____.
2. The _____ of the line. This will be our _____.

Let’s give it a try...



1) What is the equation of the **red** line?

2) What is the equation of the **green** line?

3) What is the equation of the **blue** line?

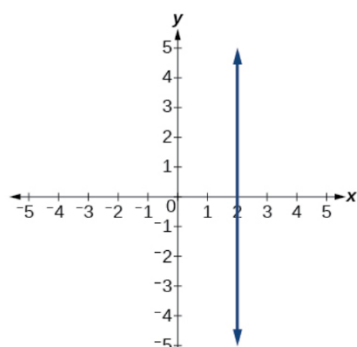
4) What is the equation of the **yellow** line?



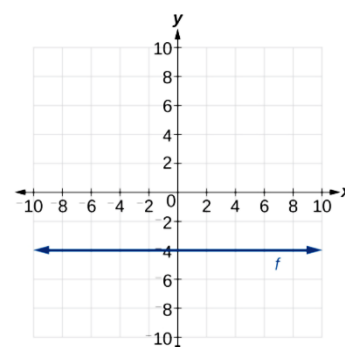
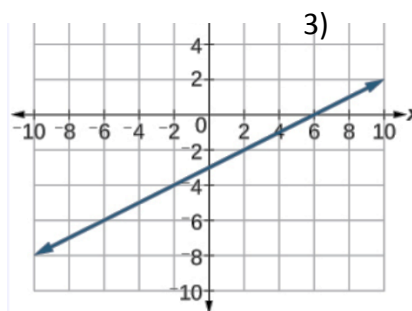
Your turn. Stop the video and complete the following problems. Then turn the video back on to check your solutions.

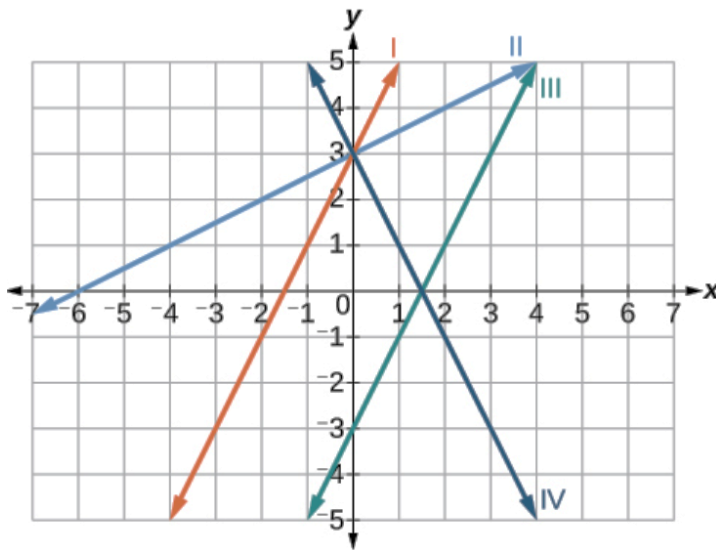
Find the equations of the following lines:

1)



3)





4) What is the equation of Line I ?

8.4

5) What is the equation of Line II ?

6) What is the equation of Line III ?

7) What is the equation of Line IV ?

But what if you are trying to find the equation of a line _____ a graph? We will use the following process:

8.4

1. Look for one of the _____ cases.

a. Horizontal line. This is where _____ = _____ .

We also know that the slope is _____ .

b. Vertical line. This is where _____ = _____ .

We also know that the slope is _____ .

2. If the line is not a special case, you can write the equation using _____ .

a. First determine the _____ . It may be given, but if not you can use the slope _____ , which is:

- b. Next determine the _____ by plugging any point (x, y) on the line into the equation and solving for the _____ value.

Let's try a few problems:

- 8) Find the equation of the line that passes through $(2, 6)$ with the slope $m = 4$.
- 9) Find the equation of the line that passes through $(-4, 1)$ and $(2, -2)$.

10) Find the equation of the linear function:

Input, x	3	5	7	9
Output, y	0	-4	-8	-12

11) Find the equation of the horizontal line that passes through $(2, -4)$.

 Find the equation of the line that passes through $(4, 2)$ with the slope $m = -1$.

13) Find the equation of the line that passes through $(-5, -2)$ and $(5, -4)$.

8.4

14) Find the equation of the linear function:

Input, x	-5	-3	-1	1
Output, y	-1	1	3	5

15) Find the equation of the vertical line that passes through $(2, -4)$.

8.4

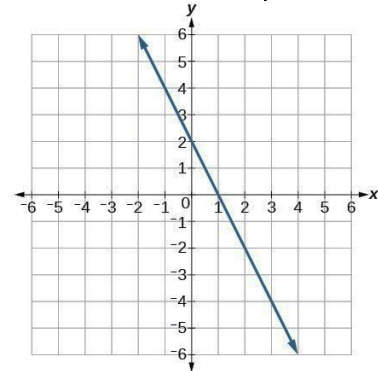
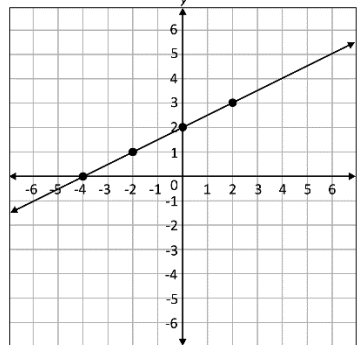
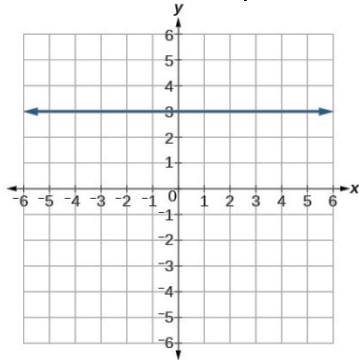
This image shows a single sheet of white paper with horizontal ruling lines. The lines are evenly spaced and run across the width of the page. There is no handwriting or other markings on the paper.

Are you ready to explain the main ideas to one of us? When you are ready, call one of us over.
Time for some practice...

8.4

Find the equations of the following lines:

1)



4)

x	1	2	3	4
y	2	5	8	11

A vertical line that passes through (8,4).

6) A line that passes through (-3,1) and (1,5).

7) $y = -2x + 1$

8) $y = 1$

9) $y = -\frac{1}{2}x - 2$

Algebra Essentials, Unit 8

8.5 - Graphing Linear Inequalities

Notes:

Let's bring some more concepts together...

First think back to Unit 6... Let's graph the following inequalities:

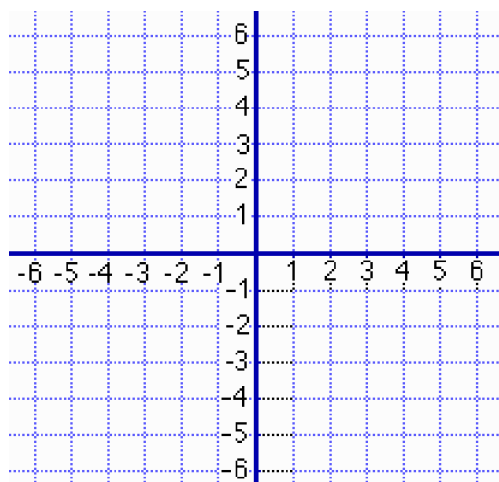
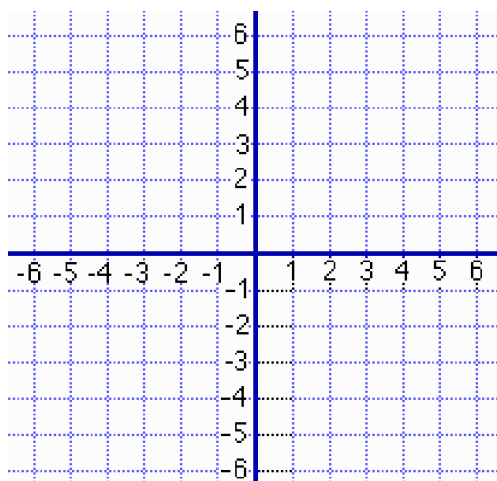
$x \leq -2$

$7 > x$

Now think back to earlier in this unit... Let's graph the following lines:

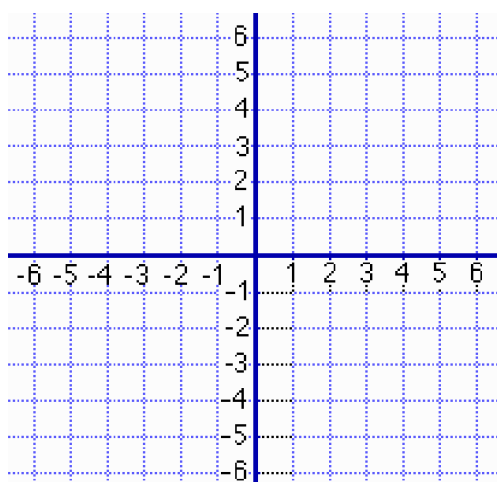
$y = -\frac{1}{3}x + 1$

$x = -4$

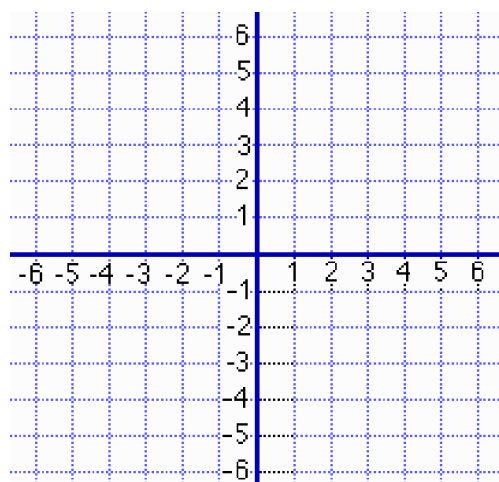


Drumroll please... Let's put these concepts together by graphing the following **INEQUALITIES**:

$$x \leq -4$$



$$3x - y > 4$$



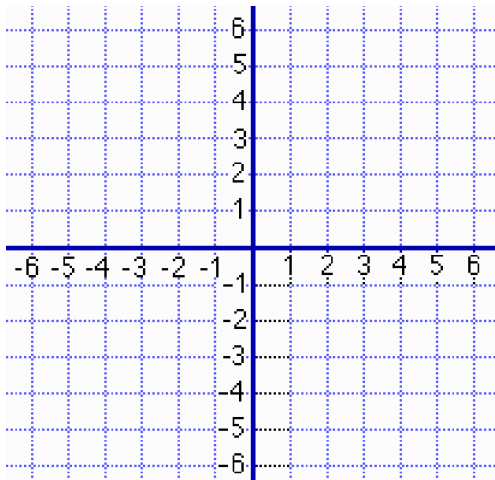
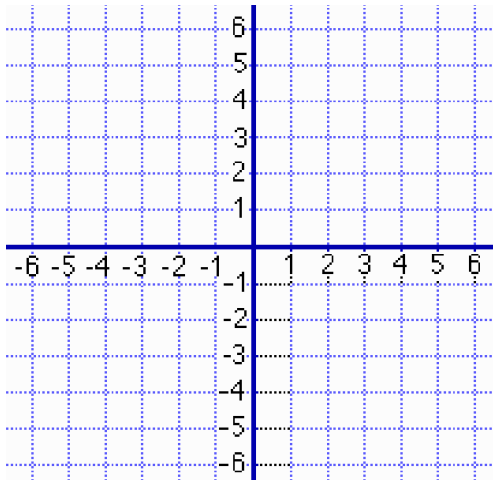


Your turn. Stop the video and complete the following problems. Then turn the video back on to check your solutions.

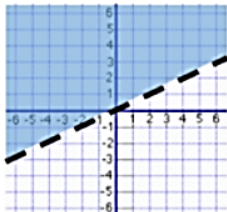
8.5

$$y < x - 3$$

$$y \geq 2$$



Here's a ⚡ quick way to remember how to shade your graph after you get the _____ by itself.

	Dashed Line	Solid Line
Shade Above	$y >$ "y is greater than"  Dashed – Shade Above	$y \geq$ "y is greater than or equal to"  Solid – Shade Above

Reread, Summarize and Reflect (RSR)

8.5

Reread the notes from this topic and summarize the main ideas below. You can use complete sentences, bullet points, examples and/or diagrams to communicate the main ideas, whatever makes the most sense to you. Then reflect on what you just wrote. Do you understand—and we mean, do you *really* understand—what you just learned? Can you explain it to someone else?



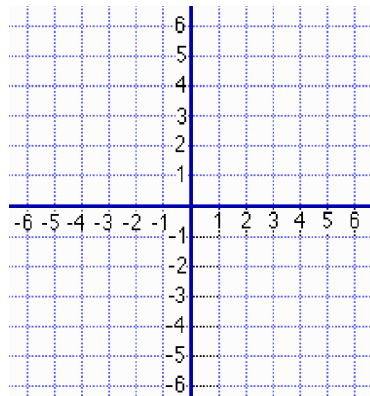
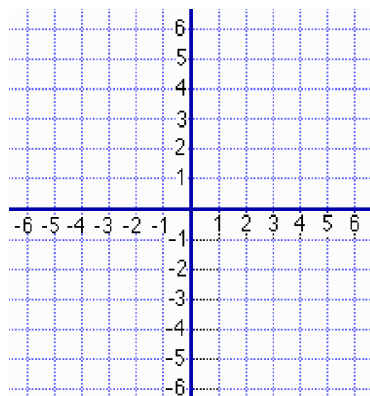


Are you ready to explain the main ideas to one of us? When you are ready, call one of us over.
time for some practice...

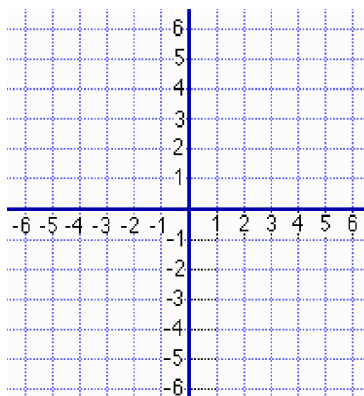
Graph the inequality or system of inequalities.

8.5

1) $y < \frac{1}{2}x - 3$



2) $y \geq -3x$



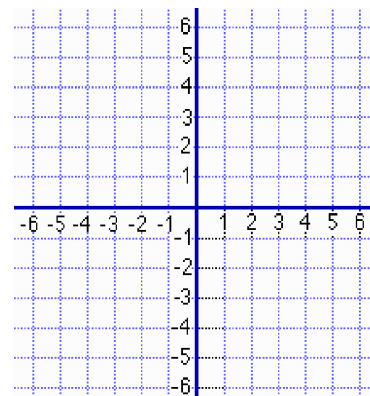
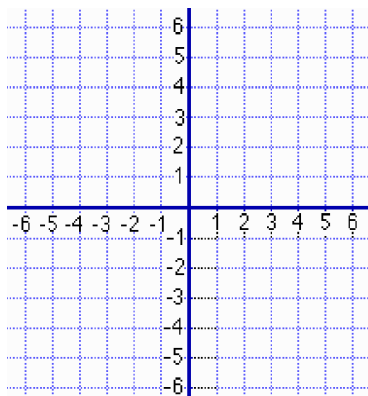
3) $y > -2$

4) $-2x + 4y \leq -8$



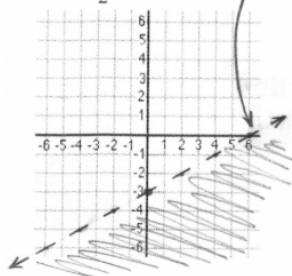
Do your work for #4 below.

5) $x \leq -4$

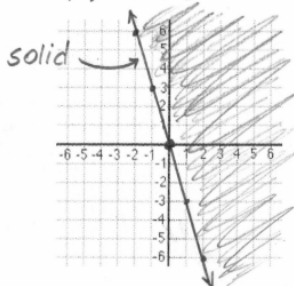


Solutions (no peeking):

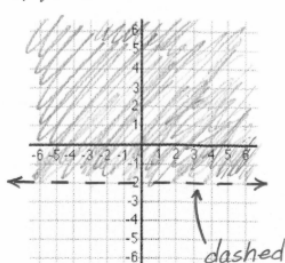
1) $y < \frac{1}{2}x - 3$ dashed



2) $y \geq -3x + 0$ solid

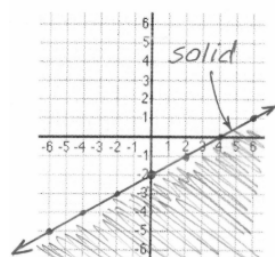


3) $y > -2$



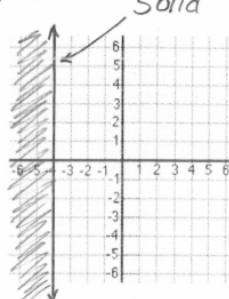
4) $-2x + 4y \leq -8$

Do your work for #4 below.



$$\begin{array}{r} -2x + 4y \leq -8 \\ +2x \quad +2x \\ \hline 4y \leq 2x - 8 \\ \frac{4y}{4} \leq \frac{2x-8}{4} \\ y \leq \frac{1}{2}x - 2 \end{array}$$

5) $x \leq -4$ solid



Stained Glass Window Project

Objective: Design your own “stained glass window” like the one on the back page of this packet.

Requirements: Draw 10 or more lines to create a design:

- At least 3 lines must have a different positive slopes.
- At least 3 lines must have a different negative slopes.
- At least 1 lines must have a zero slope.
- At least 1 lines must have an undefined slope.
- Draw at least 2 lines of your own choice.

Use a long straightedge and be precise. All lines, except for vertical lines, must have y-intercepts that are visible. Neatly and clearly label each line with its corresponding equation. You will be graded on the precision of your lines as well as the accuracy of your equations. Color your “stained glass window” to your liking.

