

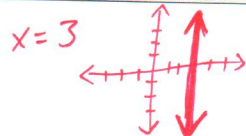
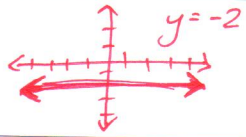
STRAIGHT LINES

3

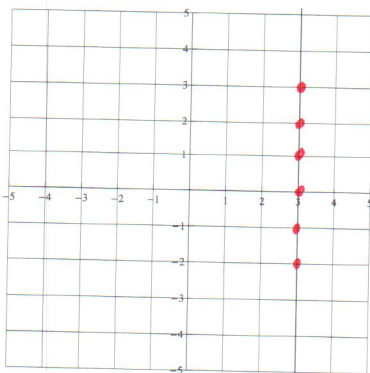
SECTION 3.1 HORIZONTAL AND VERTICAL LINES

Name: Key Date: _____ Period: _____

Vocabulary

DEFINITION	EXAMPLE
Equation of Vertical Line All points on the line have the same first coordinate, $x = a$ number	$x = 3$ 
Equation of Horizontal Line All points on the line have the same second coordinate, $y = a$ number	$y = -2$ 

EXPLORATION 1



Consider the graph of the vertical line shown in the figure. Identify and label 5 points on the line. What property do all the points share?

x	y
3	3
3	2
3	1
3	0
3	-1
3	-2

All have an x-coordinate of 3.

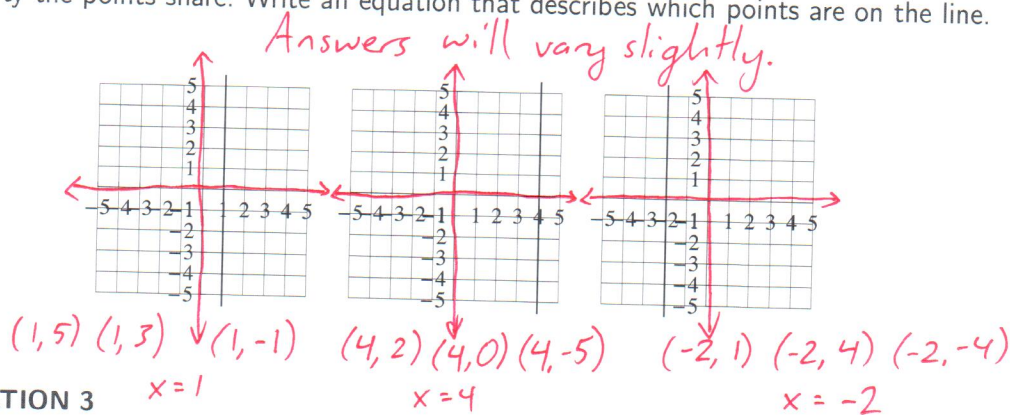
EXPLORATION 2

Use the condition "a point (x, y) is on the line if $x = 3$ " to test which of the following points are on the vertical line shown in exploration 1.

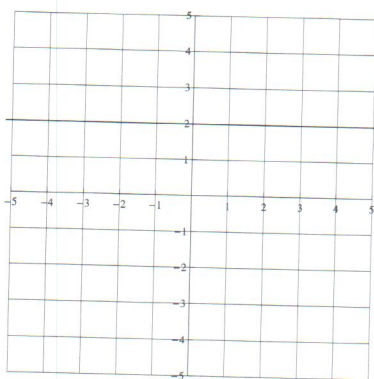
- a) $(3, 0)$ *yes* b) $(0, 3)$ *no* c) $(3, 2)$ *yes*
 d) $(3, -6)$ *yes* e) $(2, 1)$ *no* f) $(-1, 3)$ *no*

PROBLEM 1

Consider the vertical lines shown below. For each line, identify and label 3 points, and describe the property the points share. Write an equation that describes which points are on the line.



EXPLORATION 3



Consider the graph of the *horizontal line* shown in the figure. Identify and label 3 points on the line. What property do all the points share? Write an equation that tests if a point is on the line.

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

Every y-coordinate is 2.
 $y = 2$

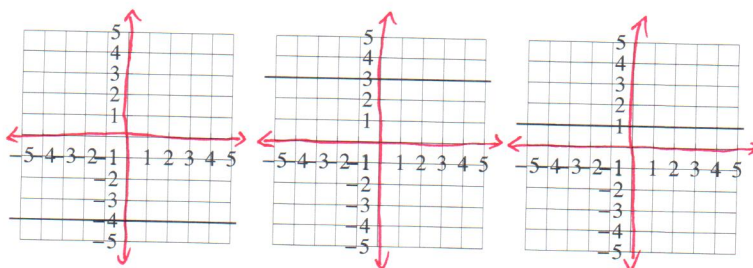
EXPLORATION 4

Use the point tester "a point (x, y) is on the line if $y = 2$ " to determine which of the following points are on the horizontal line shown in Exploration 3.

- a) $(0, 2)$ ✓ b) $(0, 3)$ ✗ c) $(3, 2)$ ✓
 d) $(2, -6)$ ✗ e) $(2, 1)$ ✗ f) $(-1, 3)$ ✗

PROBLEM 2

Consider the horizontal lines shown below. For each line, identify and label 3 points, describe the property the points share, and then find an equation for the line.



x	y
-5	-4
2	-4
3	-4

$y = -4$

x	y
1	3
0	3
-2	3

$y = 3$

x	y
3	1
2	1
-1	1

$y = 1$

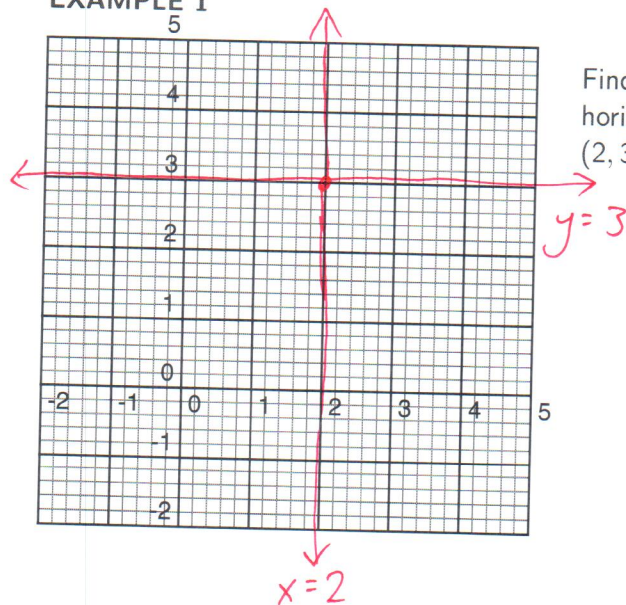
EXPLORATION 5

In Problem 1 we noticed that points on the vertical lines were described by equations of the form $x = a$ for some number a . Do you think that all vertical lines are described by equations of this type? Explain. How about horizontal lines, what form do the equations have?

Yes. $x=a$ means all x -coordinates are a , which is true of a vertical line.

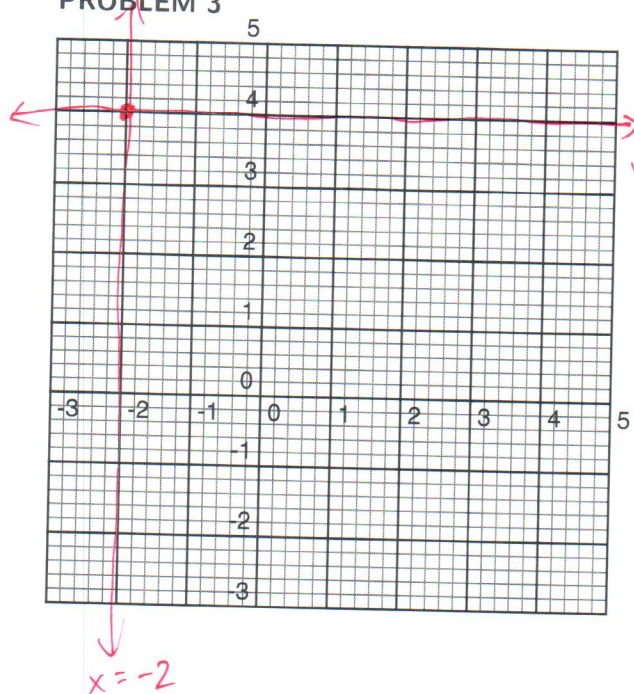
$y=b$ means all y -coordinates are b , which is true of a horizontal line.

One of the common tasks in algebra is to find the equation for a line through a given point satisfying some given property.

EXAMPLE 1

Find the equation of the vertical line and the horizontal line that pass through the point $(2, 3)$. Graph the lines.

PROBLEM 3



Find the equation of the horizontal line and the vertical line that pass through the point $(-2, 4)$. Graph the lines.

$$y = 4$$

$$x = -2$$

PROBLEM 4

1. We call the horizontal line through the origin $(0, 0)$ the x -axis. Find its equation.
2. We call the vertical line through the origin $(0, 0)$ the y -axis. Find its equation.

$$y = 0$$

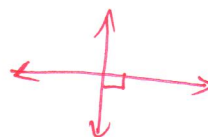
$$x = 0$$

EXPLORATION 6

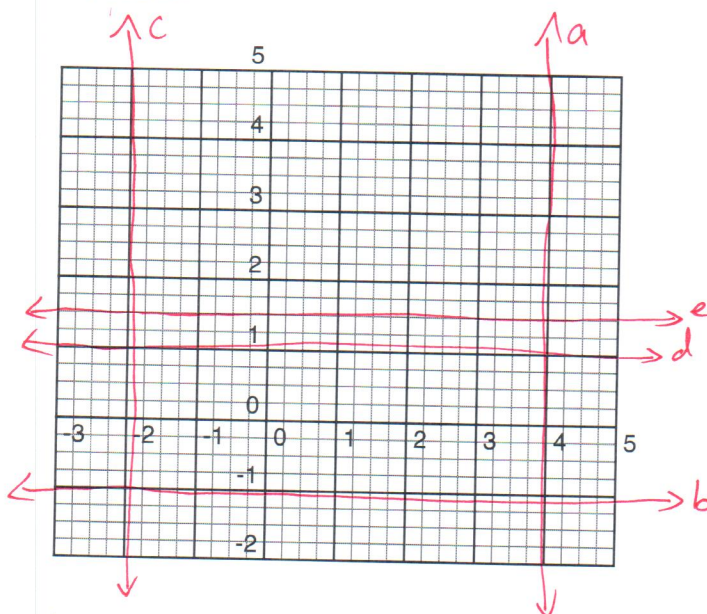
1. What does it mean to say two lines are *parallel*?
2. What does it mean to say two lines are *perpendicular*?

They never intersect. For example, both horizontal or both vertical.

They intersect at a 90° (right) angle.
For example, a horizontal AND vertical line.



3. On one coordinate grid, make a graph of the vertical and horizontal lines described by the equations:



a) $x = 4$

b) $y = -1$

c) $x = -2$

d) $y = 1$

e) $y = \frac{3}{2}$

4. Which pairs of lines in part 3 are parallel? Which pairs of lines in part 3 are perpendicular?

a and c
e and d
e and b
d and b

c and e a and e
c and d a and d
e and b a and b

SUMMARY (What I learned today)
