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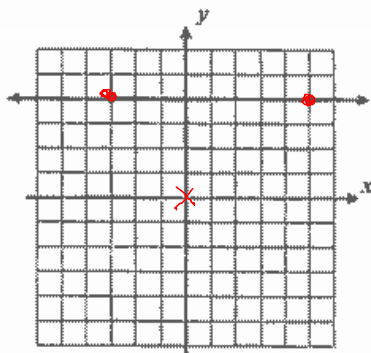
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## STRANGE LINES – VERTICAL AND HORIZONTAL



Although they don't fit the classic linear model, it is important to understand how we write equations for horizontal and vertical lines. The first exercise will illustrate the idea. Never forget, though, that when we create an equation for a curve, it simply describes what all points on the curve share in common.

Exercise #1: Shown below are a horizontal line and a vertical line.



## HORIZONTAL LINE

$$m=0$$

Write down two coordinate points:

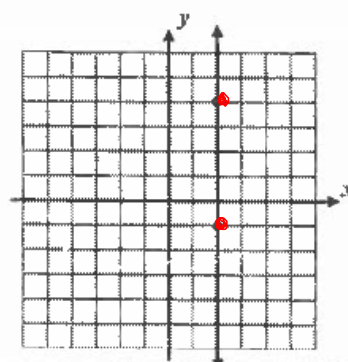
$(-3, 4)$   $(5, 4)$

What do they share in common?

y-coordinate of 4

What is this line's equation?

$$y = 4$$



## VERTICAL LINE

$$m = \text{undefined}$$

Write down two coordinate points:

$(2, 4)$   $(2, -1)$

What do they share in common?

x-coordinate of 2

What is this line's equation?

$$x = 2$$

Equations of horizontal lines and vertical lines are so simple that students will often get them confused later, because they don't really seem like typical linear equations (because they aren't).

## HORIZONTAL AND VERTICAL LINES

Horizontal Line:  $y = \text{constant}$

Vertical Line:  $x = \text{constant}$

(Constants can be determined by using any point the line passes through)

Exercise #2: Which of the following equations represents a vertical line that passes through the point  $(5, -3)$ ?

(1)  $y = -3$

(3)  $y = -3x + 5$

(2)  $x = 5$

(4)  $y = 5x - 3$

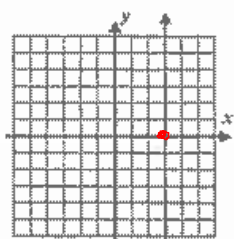
$$x = 5$$

6

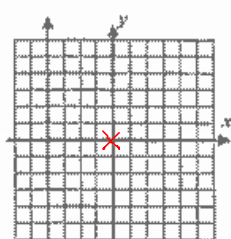
It is important to be able to quickly and accurately graph vertical and horizontal lines as well as give their equations based on their graphs. We will try to build some fluency with this in the next exercise.

**Exercise #3:** For each of the following, give the equation of the line shown or described.

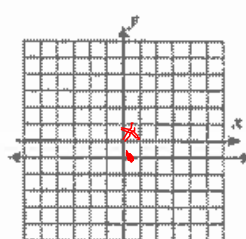
(a)

EQUATION:  $x=3$ 

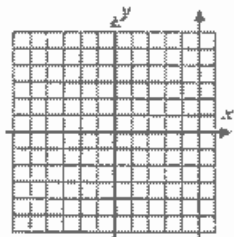
(b)

EQUATION:  $x=-4$ 

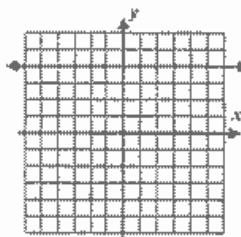
(c)

EQUATION:  $y=-1$ 

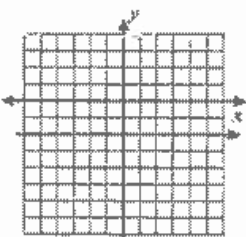
(d)

EQUATION:  $x=5$ 

(e)

EQUATION:  $y=4$ 

(f)

EQUATION:  $y=2$ 

(g) The equation of a vertical line passing through the point  $(-4, 5)$ .

$$x = -4$$

(h) The equation of a horizontal line passing through the point  $(3, 2)$ .

$$y = 2$$

**Exercise #4:** Sketch the region bounded by the three lines whose equations are given below. Label each with its equation. Find the area of the triangular region enclosed by the lines. You may want to use your calculator to create a table of values of the first line or simply use facts about the slope and y-intercept.

$$y = 2x - 4 \text{ slanted}$$

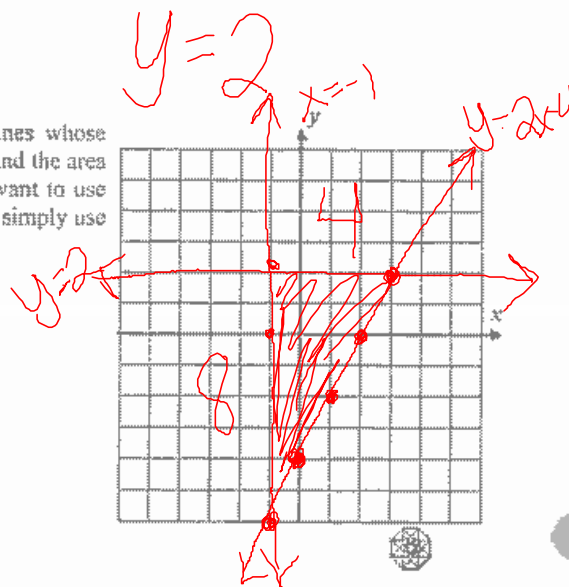
$$m = 2, b = -4$$

$$x = -1$$

vertical

$$y = 2$$

horizontal



$$A = \frac{1}{2}bh = \frac{1}{2}(4)(8) = 16 \text{ square units}$$