Math 10 Lecture Videos

Section 3.2: Graphing Linear Equations Using Intercepts

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OBJECTIVES:

1. Use a graph to identify intercepts.
2. Graph a linear equation in two variables using intercepts.
3. Graph horizontal and vertical lines.

Objective 1: Use a graph to identify intercepts.

Remember!!!

- All equations in the form of Ax + By = C are <u>straight</u> lines when graphed, as long as A and B are <u>not both zero</u>.
  - **Standard Form of Equation of a Line**

- To graph equations of this form, two very important points are used – the **intercepts**.
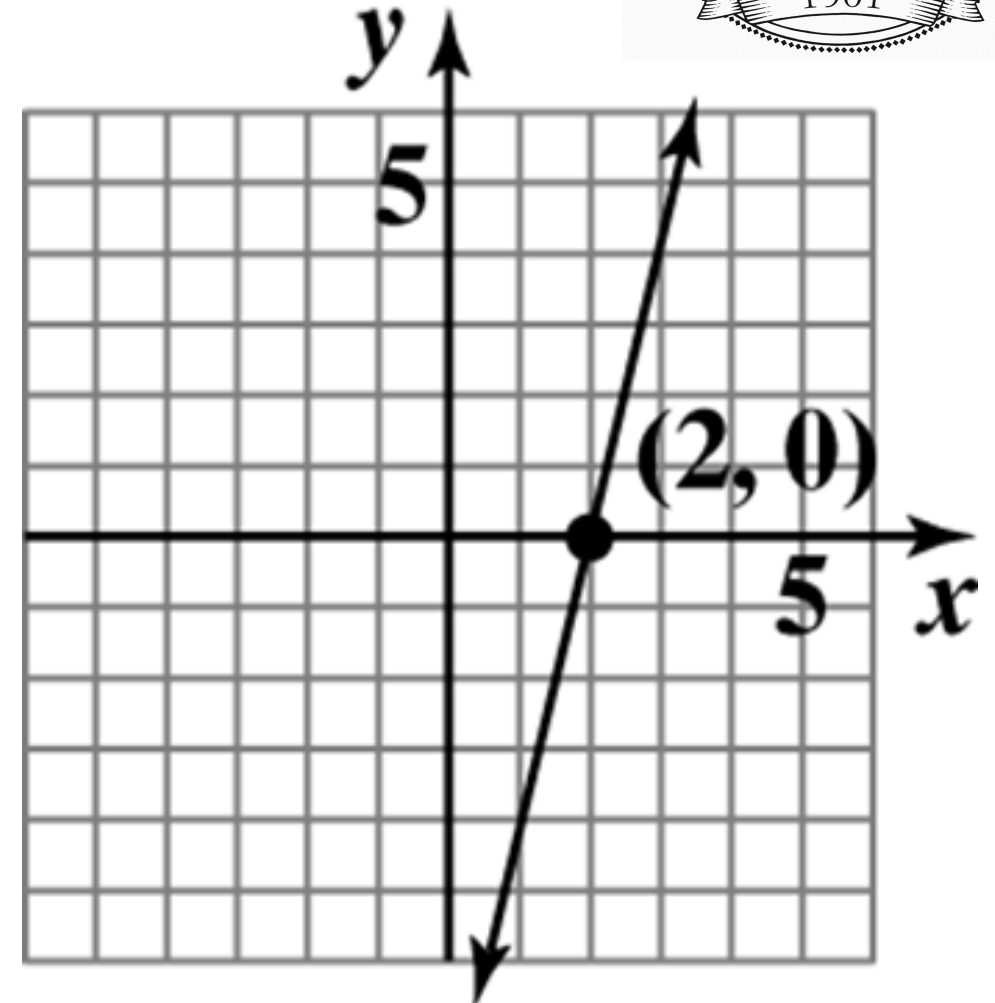
Intercepts are points, not just numbers.

Objective 1: Use a graph to identify intercepts.

x - intercept

- *x*-coordinate of a point where the graph intersects the *x*-axis
- *y*-coordinate corresponding to an *x*-intercept is always zero.

Example: The graph of **y = 4x - 8** crosses the *x*-axis at (2, 0) and that point is the *x*-intercept.
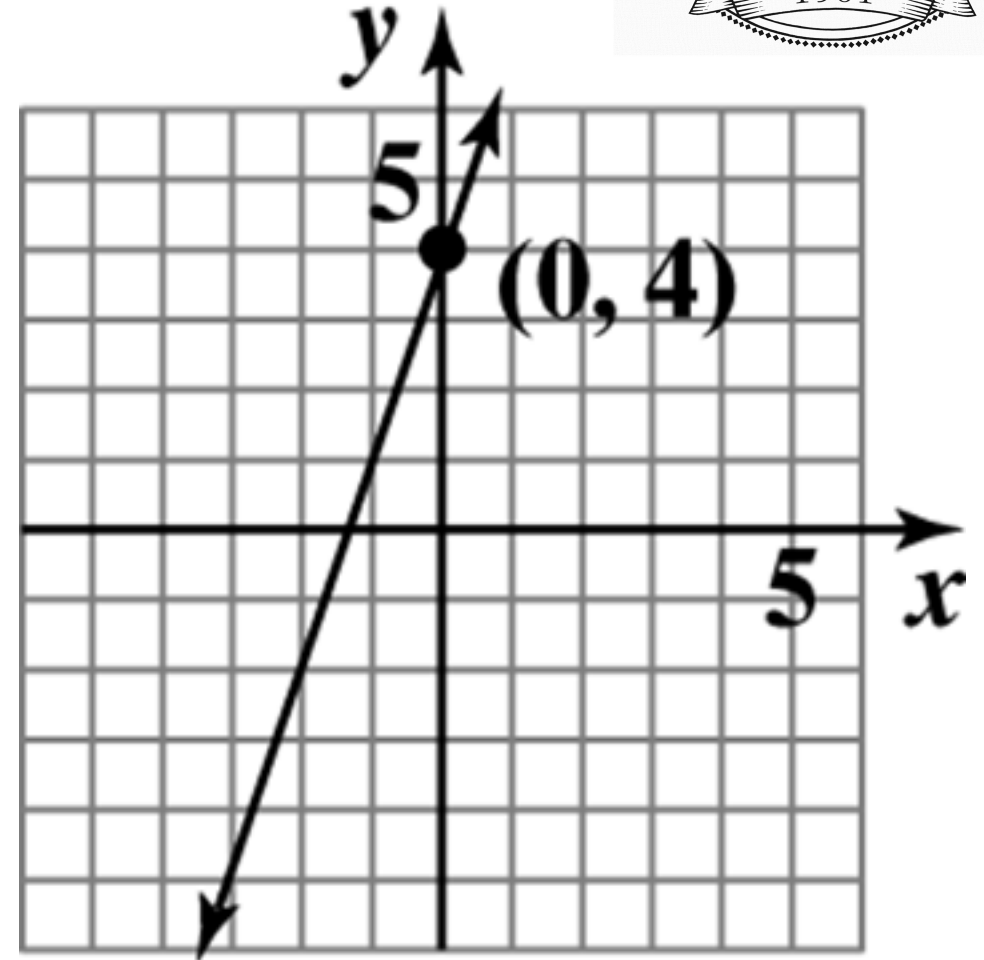
Objective 1: Use a graph to identify intercepts.

y - intercept

- *y*-coordinate of a point where the graph intersects the *y*-axis
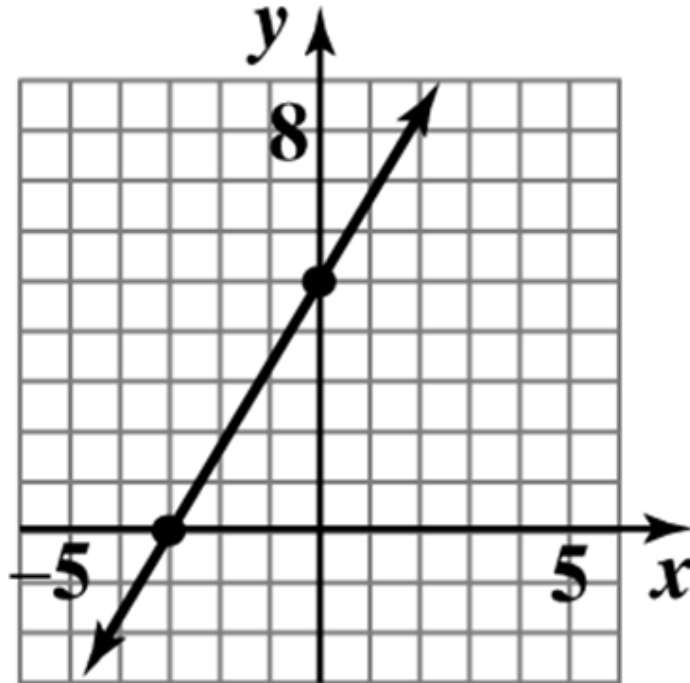- *x*-coordinate corresponding to an *y*-intercept is always zero.

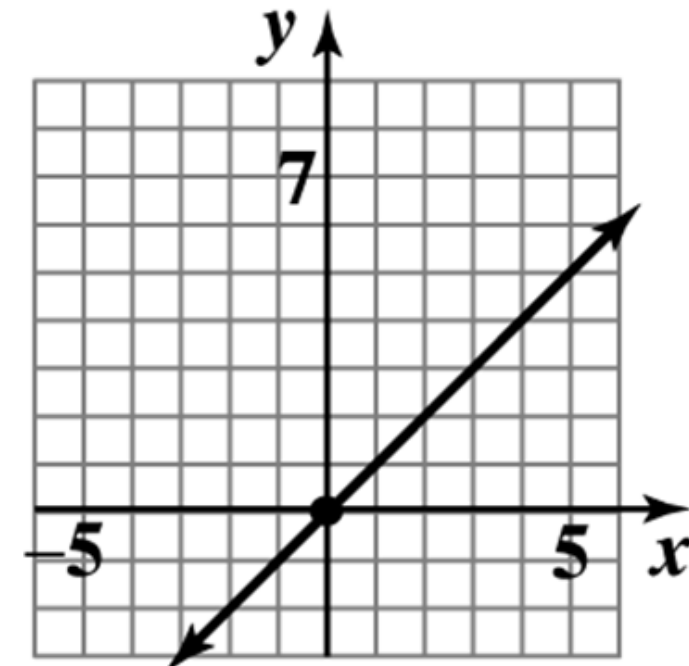Example: The graph of **y = 3x + 4** crosses the *y*-axis at (0, 4) and that point is the *y*-intercept.

Objective 1: Use a graph to identify intercepts.

Examples: Identify the x- and y-intercepts

The graph crosses the *x*-axis at (−3,0). Thus, the ***x*-intercept is −3**. The graph crosses the *y*-axis at (0,5). Thus, the ***y*-intercept is 5**.

The graph crosses the *x*-axis at (0,0). Thus, the ***x*-intercept is 0**. The graph crosses the *y*-axis at (0,0). Thus, the ***y*-intercept is 0**.

Objective 2: Graph a linear equation in two variables using intercepts.

Using Intercepts to Graph $Ax + By = C$
1. Find the x-intercept. Let $y = 0$ and solve for x.
2. Find the y-intercept. Let $x = 0$ and solve for y.
3. Find a checkpoint, a third ordered-pair solution.
4. Graph the equation by drawing a line through the *three* points.

Objective 2: Graph a linear equation in variables using intercepts.

Example 1: Graph the equation using intercepts.

-2x + 4y = 12

1. Find the x-intercept. Let y = 0 and then solve for x.

$$-2x + 4y = 12$$

$$-2x + 4 \cdot 0 = 12 \qquad \text{Replace } y \text{ with 0.}$$

$$-2x = 12 \qquad \text{Divide both sides by -2 and simplify.}$$

$$x = -6$$

The *x*-intercept is –6, so the line passes through (–6,0).

Objective 2: Graph a linear equation in variables using intercepts.

Example 1: Graph the equation using intercepts.

-2x + 4y = 12

2. Find the y-intercept. Let x = 0 and then solve for y.

$$-2x + 4y = 12$$
$$-2 \cdot 0 + 4y = 12 \qquad \text{Replace } x \text{ with 0.}$$
$$4y = 12 \qquad \text{Divide both sides by 4 and simplify.}$$
$$y = 3$$

The *y*-intercept is 3, so the line passes through (0,3).

Objective 2: Graph a linear equation in variables using intercepts.

Example 1: Graph the equation using intercepts.

-2x + 4y = 12

3. Find a checkpoint, a third ordered-pair solution. Let x =1 (because x = 1 is not the x-intercept) and find the corresponding value for y.

The checkpoint is the ordered-pair (1, 3.5)

-2x + 4y = 12

-2(1) + 4y = 12   Replace x with 1

-2 + 4y = 12

-2 + 4y + 2 = 12 + 2   Add 2 to both sides.

4y = 14

y = 14/4 = 7/2 = 3.5   Simplify
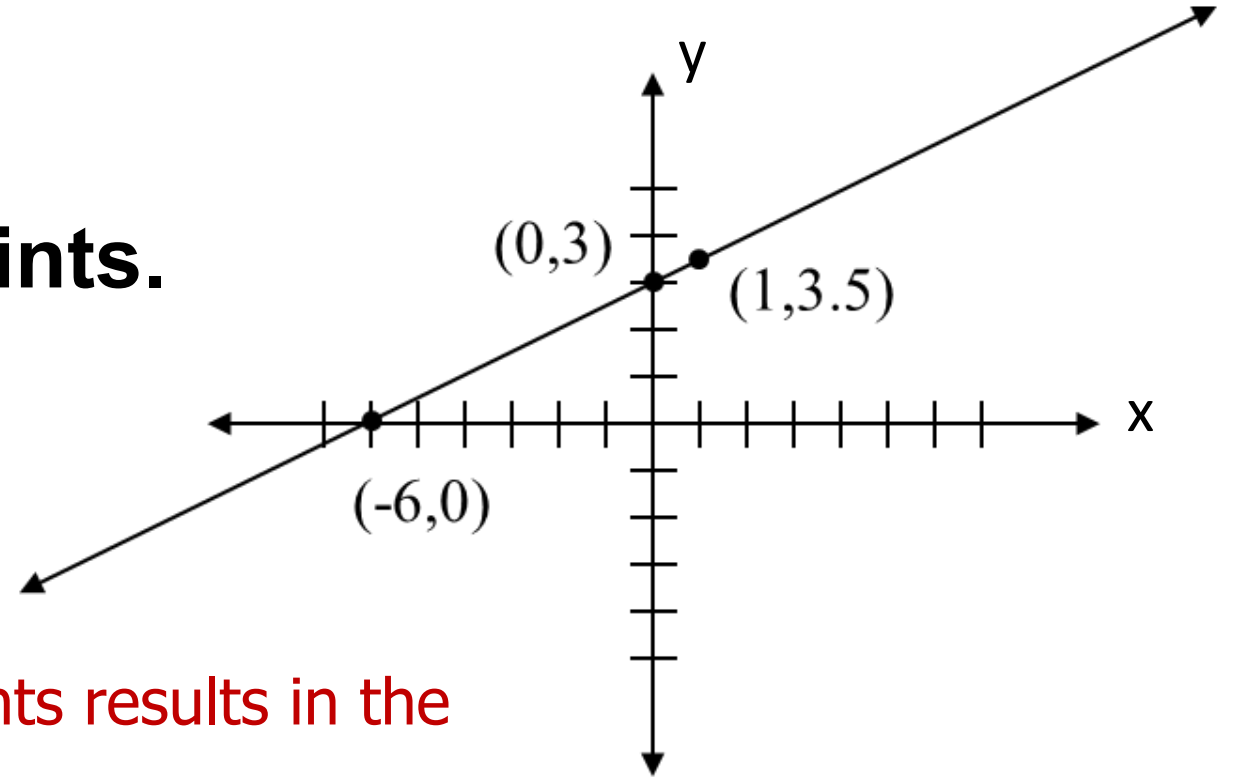
Objective 2: Graph a linear equation in variables using intercepts.

Example 1: Graph the equation using intercepts.

-2x + 4y = 12

4. Graph the equation by drawing a line through points.

Drawing a line through the three points results in the graph of -2x + 4y = 12.

Objective 2: Graph a linear equation in variables using intercepts.

Example 2: Graph the equation using intercepts.

x + 3y = 0

Note: Because the constant on the right is 0, the graph passes through the origin. The *x*- and *y*-intercepts are both 0 . Thus we will need to find two more points.

First Point: Let $y = -1$ and solve for *x*.

$$x + 3y = 0$$
$$x + 3(-1) = 0 \qquad \text{(3, -1)}$$
$$x - 3 = 0$$
$$x = 3$$

Second Point: Let $y = 1$ and solve for *x*.

$$x + 3y = 0$$
$$x + 3(1) = 0 \qquad \text{(-3, 1)}$$
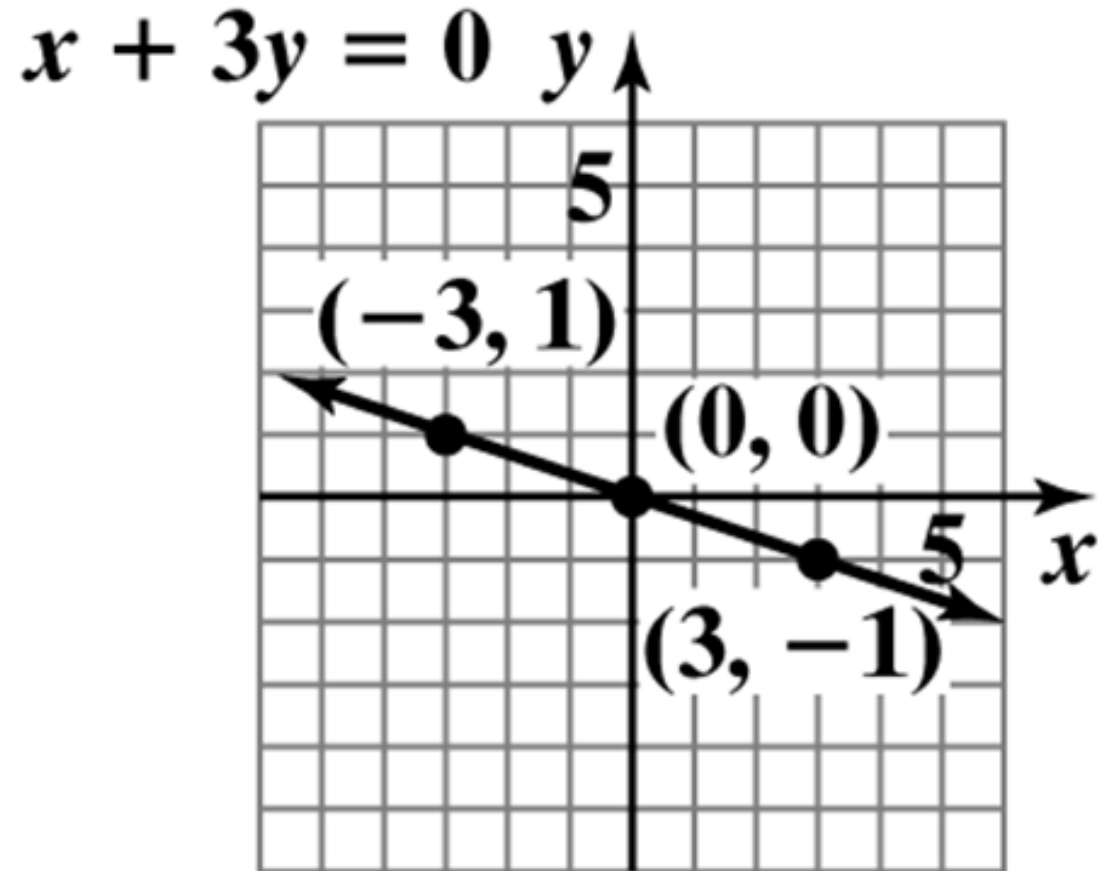$$x + 3 = 0$$
$$x = -3$$

Objective 2: Graph a linear equation in variables using intercepts.

Example 2: Graph the equation using intercepts.

x + 3y = 0

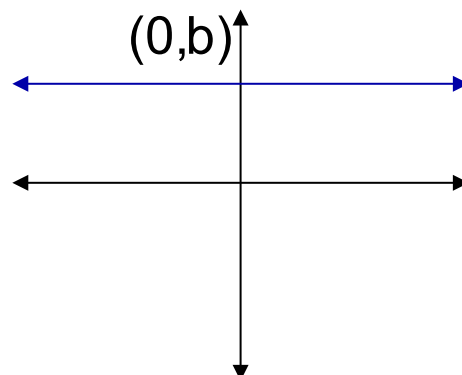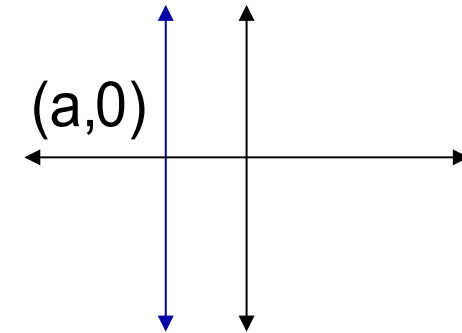Use these three solutions of (0,0), (3,−1), and (− 3,1) to graph the equation

$$x + 3y = 0$$

Objective 3:
Graph horizontal or vertical lines.

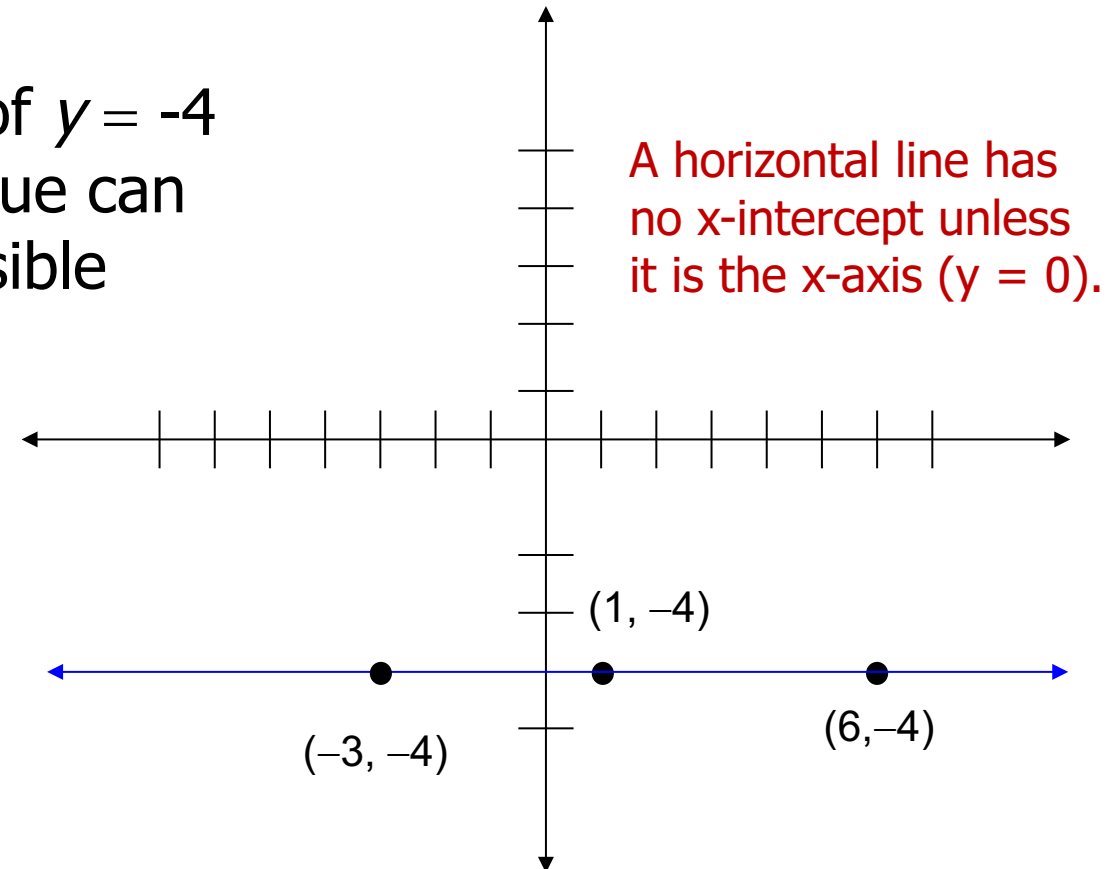|	
Equation of a Horizontal Line	(0,b)
A horizontal line is given by an equation of the form $y = b$ where b is the y-intercept.	
Equation of a Vertical Line	(a,0)
A vertical line is given by an equation of the form $x = a$ where a is the x-intercept.	

Objective 3:
Graph horizontal or vertical lines.

Example 1: Graph the linear equation $y = -4$

Note: All ordered pairs that are solutions of $y = -4$ have a value of y that is always -4. Any value can be used for x. Let's select three of the possible values for x: -3, 1, 6.

A horizontal line has no x-intercept unless it is the x-axis (y = 0).

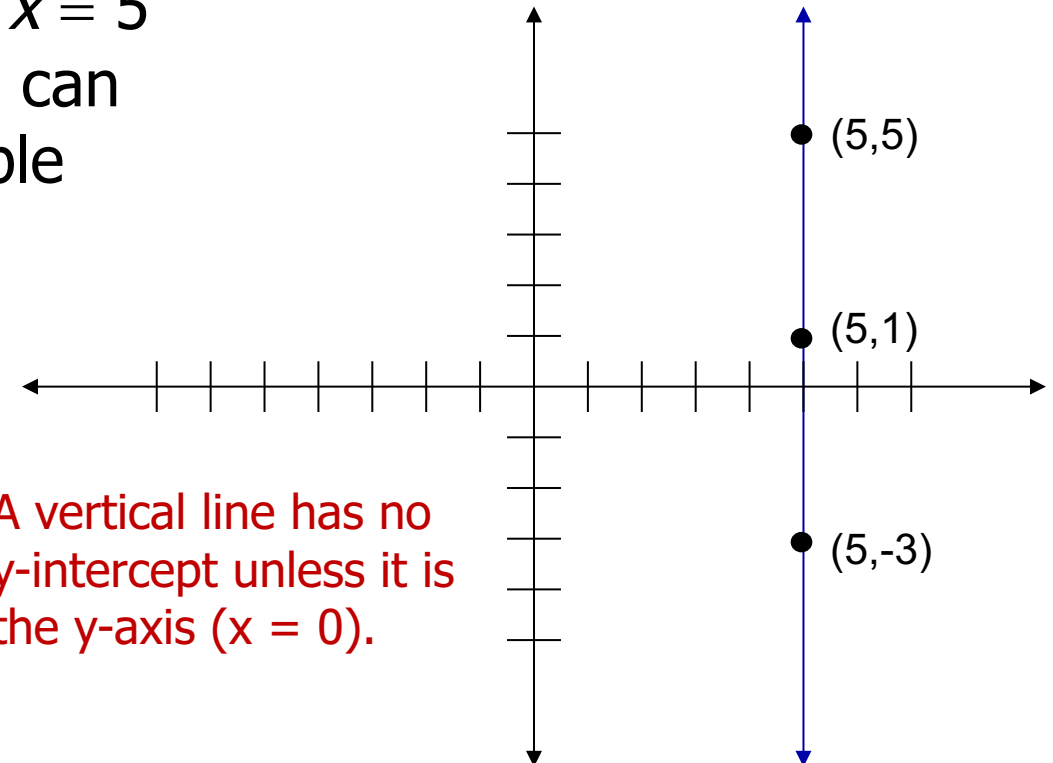| x	$y = -4$	(x, y)
-3	-4	(-3, -4)
1	-4	(1, -4)
6	-4	(6, -4)

(1, −4)

(−3, −4)

(6,−4)

Objective 3:
Graph horizontal or vertical lines.

Example 2: Graph the linear equation *x = 5.*

Note: All ordered pairs that are solutions of $x = 5$ have a value of *x* that is always 5. Any value can be used for *y*. Let's select three of the possible values for *y*: -3, 1, 5.

X = 5	y	(x, y)
5	-3	(5, -3)
5	1	(5, 1)
5	5	(5, 5)

A vertical line has no y-intercept unless it is the y-axis (x = 0).

(5,5)

(5,1)

(5,-3)

OBJECTIVES:

1. Use a graph to identify intercepts. ✓
2. Graph a linear equation in two variables using ✓ intercepts.
3. Graph horizontal and vertical lines. ✓