## Math-2

# Lesson 3-1

# **Equations of Lines**



y = x + 1 So far we've picked on "<u>integer</u>" values for 'x'. We can also pick rational numbers between the integers.







y = x + 1

So far, we've used integers and #'s halfway in between.

How many numbers are there between any 2 integers?.



<u>Slope Intercept Form</u>: An equation of the form y = mx + b. Where m = slope and b = y intercept.

<u>Y-intercept</u>: The <u>y-coordinate</u> of a point where the graph intersects the y-axis. The x-coordinate of the y-intercept will <u>always</u> equal zero. (0, y)

<u>x-intercept</u>: The <u>x-coordinate</u> of a point where the graph intersects the x-axis. The y-coordinate of the x-intercept will <u>always</u> equal zero. (x, 0)

- 1. What are the coordinates [(x, y) pair] of the x-intercept?
- 2. What are the coordinates [(x, y) pair] of the y-intercept?
- 3. What is the y-coordinate of the x-intercept?
  - 4. What is the x-coordinate of the y-intercept?





<u>Standard form of a linear equation</u>: An equation Of the form: Ax + By = C. <u>Example</u>: 3x + 4y = 12

Graphing Standard form equations.



Graph the lines.





#### What is the equation of the line?





Find the equation of a that passes through 2 points.

(-2, 3) and (4, -3)



negative slope!

Rise = -6Run = 6

$$m = \frac{rise}{run} = \frac{-6}{6} = -1$$

y = (-1)x + b

Pick either point and substitute for x and y in the equation:

(3) = (-1)(-2) + b

Solve for 'b' (the y-intercept)

(3) = 2 + b -2 -2

1= b

y = -x + 1

Find the equation of a that passes through 2 points.

(3, -1) and (-2, 2)



negative slope!

Rise = -3 Run = 5  $m = \frac{rise}{run} = \frac{-3}{5}$  $y = \frac{-3}{5}x + b$  Pick either point and substitute for x and y in the equation:

$$(3) = \frac{-3}{5}(-1) + b$$

Solve for 'b' (the y-intercept)

 $3 = \frac{3}{5} + b \qquad 12 = 5b$ \*5 \*5  $15 = 5\left(\frac{3}{5} + b\right) \qquad \frac{12}{5} = b$   $15 = 3 + 5b \qquad y = \frac{-3}{5}x + \frac{12}{5}$ -3 -3

Do not give the slope or yintercept in decimal form. What is the slope and y-intercept of the following equation?

2x - 3y = 6Convert the following equation to "slope intercept form" +3y + 3y2x = 3y + 6Slope: 2/3 y-int: (0, -2) -6 - 62x - 6 = 3y $\div 3 \div 3$  $\frac{2}{3}x - 2 = y$  $y = \frac{2}{3}x - 2$ 

Re-write slope intercept form as standard form

- Slope-intercept  $\rightarrow$  standard form y = 2x + 2-2x -2x y - 4 = 2(x - 1)-2x + y = 2y - 4 = 2x - 2-2x -2x  $y = \frac{2}{3}x - 1$ -2x + y - 4 = -2+4 +4
  - -2x + y = 2

What is the <u>name</u> of this form of equation? y = 2x + 2Slope intercept form

y = mx + b

How can you recognize this form? (4 things)

Y is a function of x (y is <u>all by itself</u>)

There are <u>no parentheses</u>

There are two variables

The exponents of the variables are <u>one</u>.

What is the <u>name</u> of this form of equation? 2x + 3y = 6Standard form

ax + by = c

How can you recognize this form? (4 things)

Constant value is all by itself

There are no parentheses

There are two variables

The exponents of the variables are <u>one</u>.

#### Parallel lines do not intersect each other.

- Which line is parallel to the line: y = 1?
- Is the red line parallel?
- Is the green line parallel?
- Is the yellow line parallel?
- Is the orange line parallel?
- Is the black line parallel? <u>yes</u>



How can you tell if the graphed lines are parallel?

Does the y-intercept help to make lines parallel? no

### Parallel $\rightarrow$ same slope y = mx + b

<u>Write the equation of a line that is parallel</u> to the line y = 2x + 1 and passes through the point (0, 4)

Slope = 2 
$$y$$
-intercept = 4  $y = 2x + 4$ 

<u>Write the equation of a line that is parallel</u> to the line y = 3x - 4 and passes through the point (3, 8)

Slope = 3 y-intercept = ?? y = 3x + b(8) = 3(3) + b 8 = 9 + b b = -1 y = 3x - 1



What two things do we know about the slopes of perpendicular lines?

The slopes are <u>reciprocals</u> of each other.

The slopes have <u>opposite</u> signs of each other.

The slopes of perpendicular lines are <u>negative reciprocals</u> of each other.

What is the slope a line that is perpendicular to each of the following? 5

$$y = 2x + 1$$
  

$$y = -\frac{3}{2}x - 4$$
  

$$y = -\frac{3}{6}x + 2$$
  

$$y = -\frac{1}{6}x - 7$$

Find the slope intercept form of a line that is perpendicular to the line:

$$y = 2x - 6$$
 and passes through the point (0, 1)

Find the slope intercept form of a line that is perpendicular to the line:  $y = \frac{1}{5}x - 8$  and passes through the point (5, 2)