

Part 1: Slope-intercept form with Ditch Diggers

Express the equations for each ditch digger that we've previously found in point-slope form, and rewrite them in function form.

	Point-Slope Form	Function Form (solve for y)
Ditch Digger 1	$y - y_1 = m(x - x_1)$ $y - 2 = \frac{1}{2}(x - 0)$ $y - 4 = \frac{1}{2}(x - 4)$ $y - 7 = \frac{1}{2}(x - 10)$ $y - 3 = \frac{1}{2}(x - 2)$	$y = mx + b$ $y = \frac{1}{2}x + 2$
Ditch Digger 2	$y - 31.5 = 0.5(x - 63)$ $y - 34 = \frac{1}{2}(x - 68)$	$y = \frac{1}{2}x + 0$

Looking at the graphs and equations, compare the lines.

- SAME SLOPE
- DIFFERENT y-intercept

} LINES WILL NEVER INTERSECT!

What connections do you see between the equations and graphs?

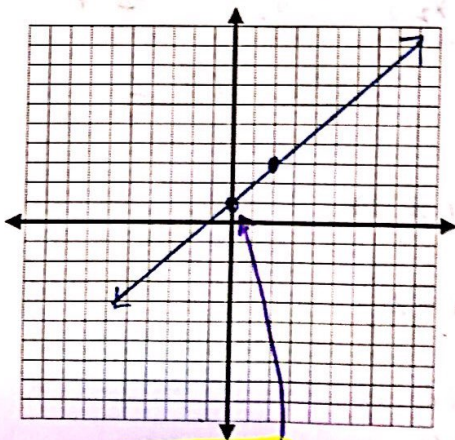
Linear functions can be written in **Function Form (aka Slope-intercept Form)**

$$y = mx + b$$

To write the equation of a line in this form, all you need to identify is

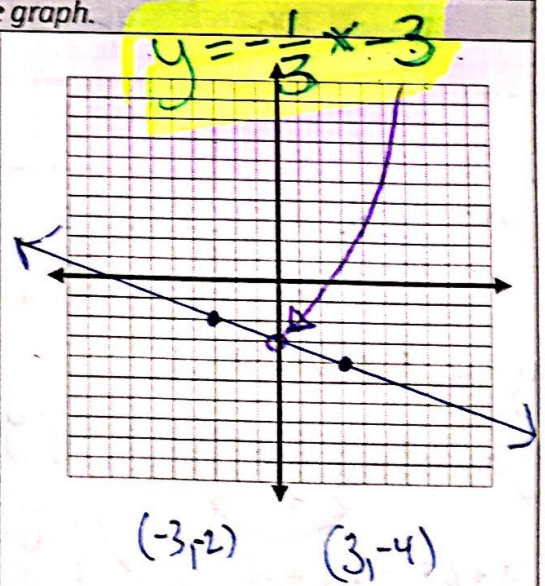
- SLOPE
- y-intercept

Example 1: Write in function form the equation of the line shown in the graph.



$$y = x + 1$$

1. Find the slope.  
This is  $m$ .
2. Find the y-intercept  
This is  $b$ .
3. Use the  $m$  and the  $b$  that you just found and write the equation of the line in function form.  
 $y = mx + b$



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



## Part 2: Identifying linear functions using tables

What makes a function linear?

- MAKES A LINE WHEN GRAPHED
- HAS A CONSTANT RATE IN OUTPUTS BETWEEN CONSECUTIVE INPUTS

Example 2: use the table to write the function that is represented by the given points.

1. Express two solutions from the table as ordered pairs.

$$(-1, 5)$$

x	y
-1	5
3	-3
7	-11

2. Using the ordered pairs, find slope.

$$m = \frac{y_2 - y_1}{x_2 - x_1} \rightarrow \frac{-11 - 5}{7 - (-1)} = \frac{-16}{8} = -2$$

$$(7, -11)$$

3. Use slope and one pair of coordinates in point-slope form.  $(-1, 5)$

$$y - 5 = -2(x - (-1))$$

$$m = -2$$

$$y - 5 = -2(x + 1)$$

4. Rewrite in function form.

$$y - 5 = -2x - 2$$

$$y = -2x + 3$$

On your own... use the table to write the function that is represented by the given points.

a).

x	y
$x_1$ 5	$y_1$ -2
$x_2$ 10	$y_2$ -6
15	-10

$$m = \frac{-6 - (-2)}{10 - 5} = \frac{-6 + 2}{5} = \frac{-4}{5}$$

$$y - y_1 = m(x - x_1)$$

$$y - (-2) = \frac{-4}{5}(x - 5)$$

$$y + 2 = \frac{-4}{5}x + \frac{20}{5}$$

$$y = \frac{-4}{5}x + 2$$

b).

x	y
$x_1$ 1	$y_1$ -1
$x_2$ 2	$y_2$ 5
3	11

$$m = \frac{5 - (-1)}{2 - 1}$$

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

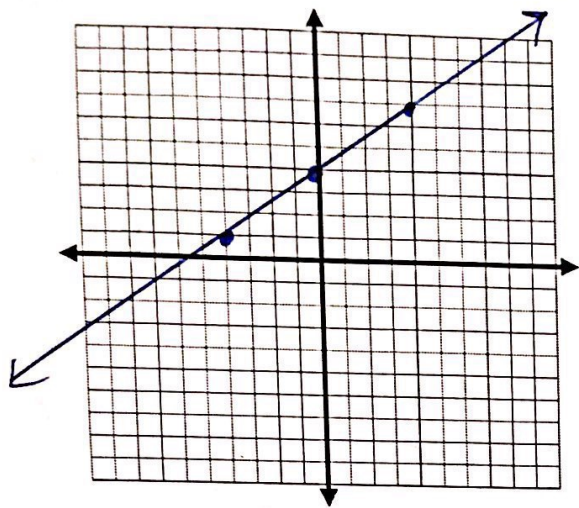
$$y - y_1 = m(x - x_1)$$

$$y - (-1) = 6(x - 1)$$

$$y - 1 = 6x - 6$$

$$y = 6x - 7$$

Part 3: How to graph a line using function form (aka slope-intercept form)



$$3x + 4y = 16$$

$$4y = \frac{-3x}{4} + \frac{16}{4}$$

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

↑ SLOPE

↑ y-INTERCEPT

1. Isolate y if it's not already.

2. Identify slope.

$$m = -\frac{3}{4}$$

Identify y-intercept.

$$b = 4$$

3. Plot y-intercept.

4. Use slope to make more points.

a. If slope is positive, from y-intercept, go up (rise value) and to the right (run value).

b. If slope is negative, from y-intercept, go down (rise value) and to the right (run value).

5. Make a point! Keep making more points in this way if you want.

Example 3: Identify the following for the function.

$$x - 3y = 6$$

• Write the equation in function form:

$$-3y = \frac{-x + 6}{-3} \quad \text{Slope-Intercept}$$

$$y = \frac{1}{3}x - 2$$

• Identify slope and y-intercept

$$m = \frac{1}{3}$$

$$b = -2$$

• Graph the line using slope-intercept form.

• Calculate the x-intercept: (6, 0)

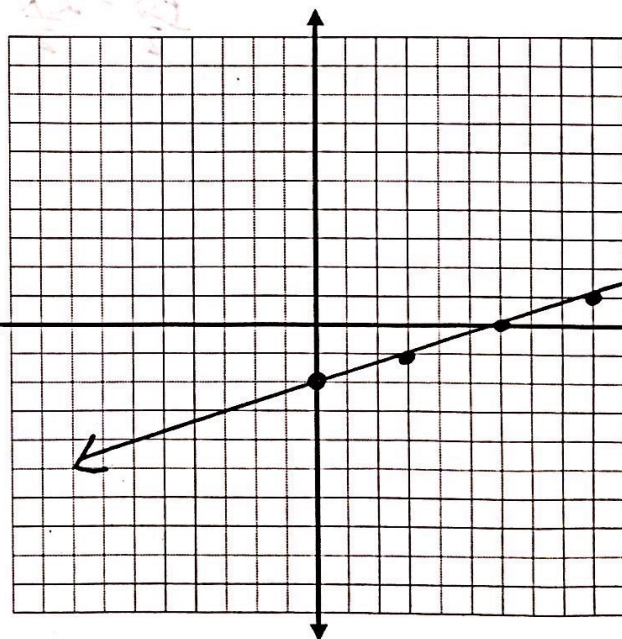
$$x - 3y = 6$$

$$x - 3(0) = 6$$

$$x = 6$$

x	y
0	-2
3	-1
6	0

Plot y-intercept





You have to put in volunteer hours to fulfill graduation requirements. Already, you've put in 25 hours and are planning on putting in 2 hours every day after school.

- Write an equation that represents the total number of hours as a function of the number of days.

$$y = 2x + 25$$

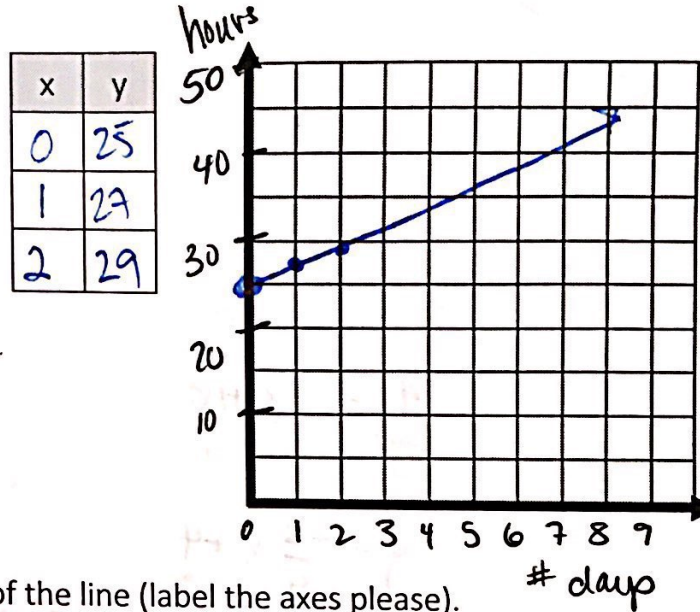
days =  $x$

- Identify the meaning of the slope:

2:  $\frac{2}{1}$  hours per day

- Identify the meaning of the y-intercept:

25: 25 hrs already worked



- Based on the information given, graph the equation of the line (label the axes please).

- How many more days you have to work before you reach 100 hours?

$$100 = 2x + 25$$

$$\begin{array}{r} 100 \\ -25 \\ \hline 75 \end{array} = \begin{array}{r} 2x \\ -25 \\ \hline 2x \end{array}$$

$$x = 37.5$$

after 38 days

Exit ticket: What are the advantages to writing a linear function in function form?