

Algebra 2 Notes

Name: Key

Section 2.3 - Graphing Linear Functions

Meteorologists are interested in the rate at which a hurricane is approaching land.

Time (h)	0	1	2	3	4
Distance from Land (mi)	350	325	300	275	250

This rate can be expressed as $\frac{\text{change in distance}}{\text{change in time}} = \frac{-25 \text{ miles}}{1 \text{ hour}}$.

Notice that the rate of change is Constant. The hurricane moves 25 miles closer every 1 hour(s).

Functions with a constant rate of change are called linear functions. A linear function can be written in the form $f(x) = mx + b$, where x is the independent variable and m and b are Constants. The graph of a linear function is a straight line made up of the set of all points that satisfy $y = f(x)$.

Example 1: Determine whether each data set could represent a linear function.

a.

x	0	2	4	6
$f(x)$	-1	2	5	8

rate of change = $\frac{3}{2}$ and is constant, so linear

b.

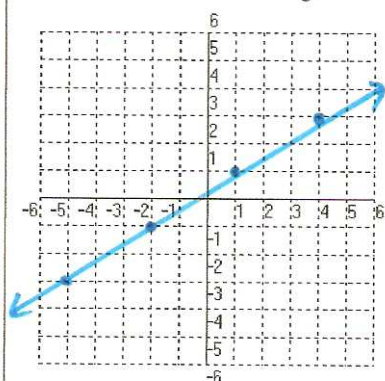
x	-1	2	5	8
$f(x)$	0	1	3	6

rate of change is NOT constant, so NOT linear

The constant rate of change for a linear function is its slope. The slope of a linear function is the ratio $\frac{\text{change in } f(x)}{\text{change in } x}$, or $\frac{\text{rise}}{\text{run}}$. The slope of a line is the same between any two points on the line. You can graph lines by using the slope and a point.

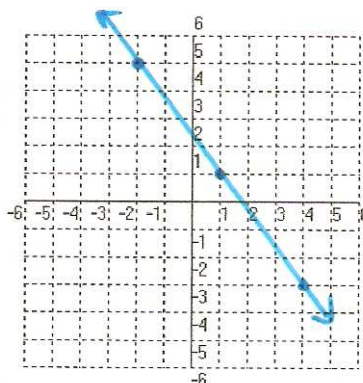
Example 2: Graph each line.

a. the line with slope $\frac{2}{3}$ that passes through (1,1)



graph pt first, then go up 2 and to the right 3

b. the line with slope $-\frac{4}{3}$ that passes through (-2,5)

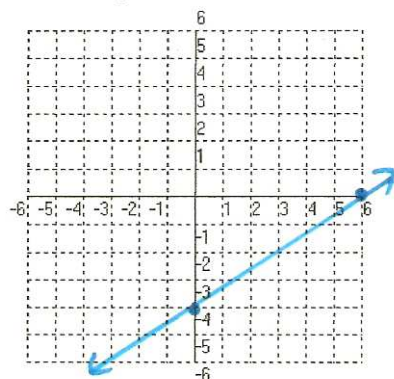


graph pt first, then go down 4 and to the right 3

Recall from Geometry that two points determine a line. Often the easiest points to find are the points where a line crosses the axes. The y-intercept is the y-coordinate of a point where the line crosses the y-axis. The x-intercept is the x-coordinate of a point where the line crosses the x-axis.

Example 3: Find the intercepts of each line and then graph the line.

a. $2x - 3y = 12$



x-int:

$$2x - 3(0) = 12$$

$$2x = 12$$

$$x = 6 \quad (6, 0)$$

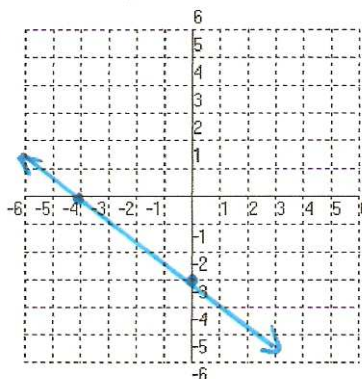
y-int

$$2(0) - 3y = 12$$

$$-3y = 12$$

$$y = -4 \quad (0, -4)$$

b. $6x + 8y = -24$



x-int:

$$6x + 8(0) = -24$$

$$6x = -24$$

$$x = -4 \quad (-4, 0)$$

y-int:

$$6(0) + 8y = -24$$

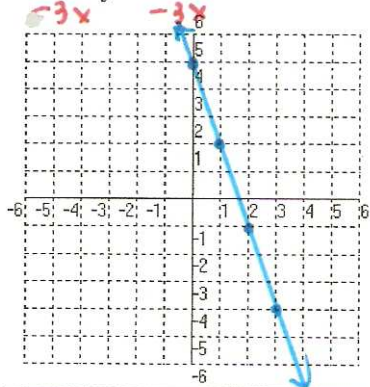
$$8y = -24$$

$$y = -3 \quad (0, -3)$$

Linear functions can also be expressed as linear equations in the form $y = mx + b$. When a linear function is written in the form $y = mx + b$, the function is said to be in slope-intercept form because m is the slope and b is the y-intercept. Notice that slope-intercept form is the equation solved for y.

Example 4: Write each function in slope-intercept form. Then graph.

a. $3x + y = 5$

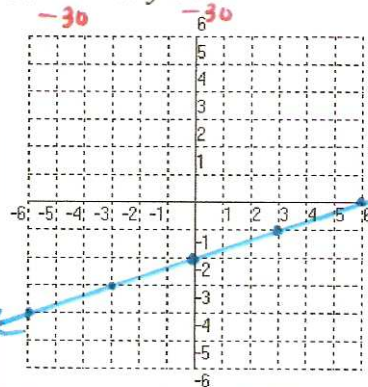


$$y = -3x + 5$$

$$m = -3$$

$$y\text{-int} = 5$$

b. $5x = 15y + 30$



$$\frac{15y}{15} = \frac{5x - 30}{15}$$

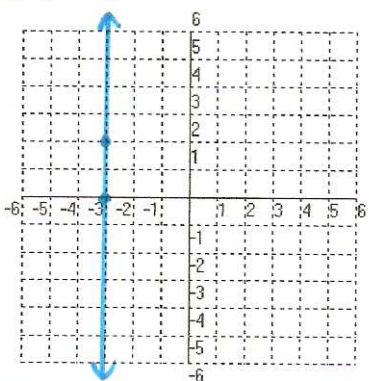
$$y = \frac{1}{3}x - 2$$

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

$$y\text{-int} = -2$$

Example 5: Determine if each line is vertical or horizontal. Then graph.

a. $x = -3$

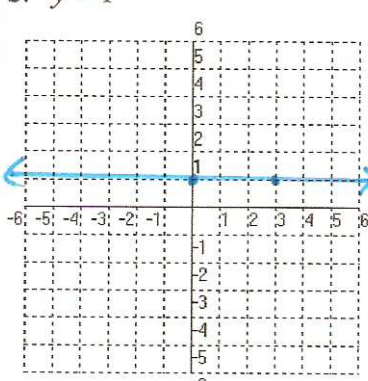


no matter
what y is,
 $x = -3$

x	y
-3	0
-3	2

Vertical

b. $y = 1$



no matter
what x is,
 $y = 1$

x	y
0	1
3	1