

Math-3A

Lesson 1-2

The Linear Function

Name _____

Period _____

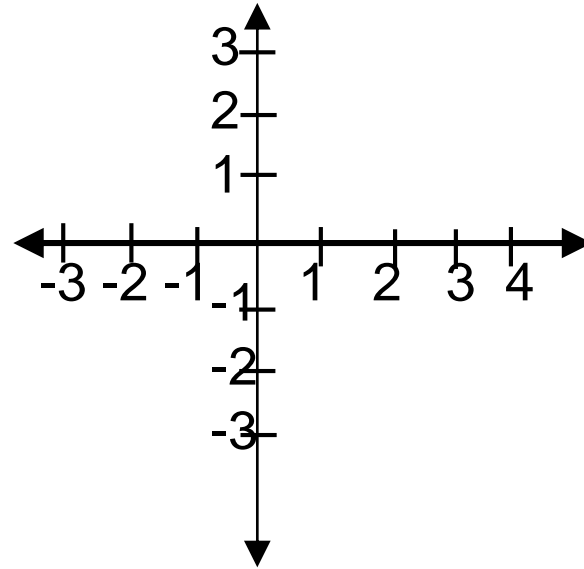
1. For the input values given in the table, use the equation below to find their corresponding output values.

$$y = -2x + 3$$

x	0	1	2
y			

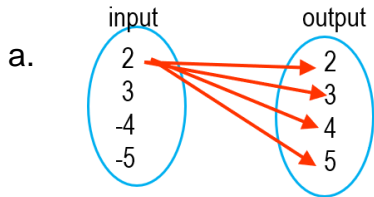
2. Graph the following x-y pairs.

x	-2	2	4
y	-3	0	3



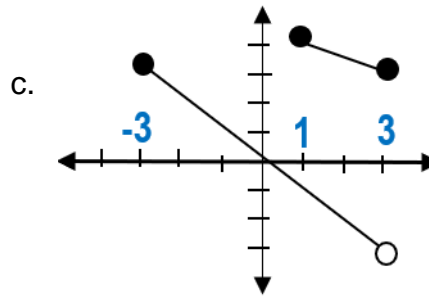
3. Name six ways to show a relation between input and output values.

4. Which of the following is/are not functions? Explain why not.



b.

x	6	6	-2
y	4	7	3



- d. (2, 5), (3, 5), (-4, 5)

Delta a Greek letter (that looks like a triangle) used in engineering and math to denote “change.”

Δx Means the change in ‘x’

Δy Means the change in ‘y’

$y = 3x - 5$

x	0	2	4
y	-5	1	7

$\Delta x = 2$ $\Delta x = 2$

$\Delta y = 6$ $\Delta y = 6$

- 1) Fill in the output values defined by the equation
- 2) Find Δx and Δy for adjacent values in each table

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$$y = 3x + 4$$

x	0	1	2
y	4	7	10

$\Delta x = 1$ $\Delta x = 1$

Notice the numbers that have been circled.

$\Delta y = 3$ $\Delta y = 3$

This number in the equation is called the SLOPE

$$y = -4x + 2$$

x	0	1	2
y	2	-2	6

$\Delta x = 1$ $\Delta x = 1$

Notice the numbers that have been circled.

$\Delta y = 4$ $\Delta y = 4$

This number in the equation is called the SLOPE

Slope

Slope can be interpreted to mean “steepness” in the real world.



$$6\% = 0.06 = \frac{6}{100}$$

6' of rise/fall for every 100' of horizontal distance

Why isn't the change in 'y' between adjacent terms equal to the coefficient of 'x'?

Fill in the tables.

$$y = 2x + 1$$

x	0	2	4
y	1	5	9

Red arrows indicate changes: +2 between x values (0 to 2, 2 to 4) and +4 between y values (1 to 5, 5 to 9).

We changed the input value to 'x' by '2' for each adjacent value in the table instead of '1'.

$$y = 3x - 5$$

x	0	2	4
y	-5	1	7

Blue arrows indicate changes: +2 between x values (0 to 2, 2 to 4) and +6 between y values (-5 to 1, 1 to 7).

$$y = 4x + 2$$

x	0	2	4
y	2	10	18

Green arrows indicate changes: +2 between x values (0 to 2, 2 to 4) and +8 between y values (2 to 10, 10 to 18).

How can you use the change in 'x' and the change in 'y' in the tables to calculate the coefficient of 'x'?

Fill in the table then graph the ordered pairs

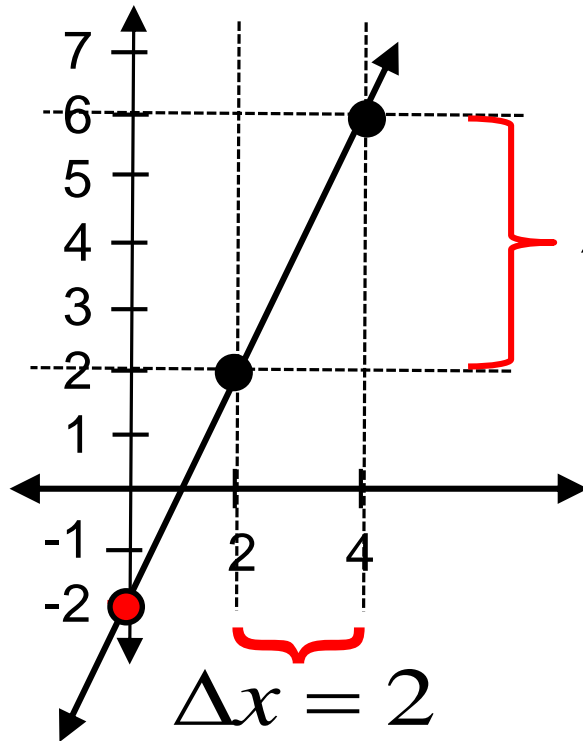
$$y = 2x - 2$$

$$\Delta x = 2 \quad \Delta x = 2$$

x	0	2	4
y	-2	2	6

$$\Delta y = 4 \quad \Delta y = 4$$

Graphing the solution to the equation will result in infinitely points
→ they all form a line.



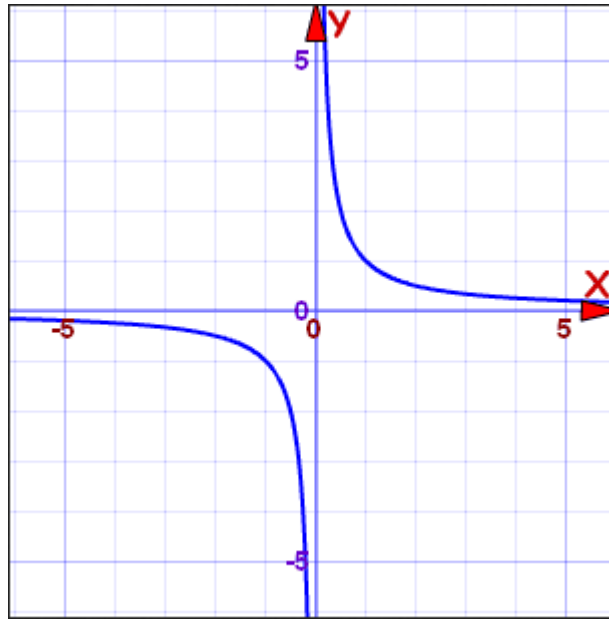
Slope (of a line) is its steepness given by $m = \frac{\Delta y}{\Delta x}$

Slope is the coefficient of 'x' when the equation is written in the form: $y = mx + b$

$$m = \frac{4}{2} = 2$$

Determining if the relation is linear.

Graph: is it linear?



The slope (steepness) needs to be constant.

Data table:

Is the data linear? **The slope is constant \rightarrow the graph of the points will be linear.**

change in	x	f(x)	
x = 2	-2	-7	$\Delta y = 2$
$\Delta x = 2$	0	-5	$\Delta y = 2$
$\Delta x = 2$	2	-3	$\Delta y = 2$
$\Delta x = 2$	4	-1	$\Delta y = 2$
$\Delta x = 2$	6	1	$\Delta y = 2$
$\Delta x = 2$	8	3	$\Delta y = 2$
$\Delta x = 2$	10	5	$\Delta y = 2$
$\Delta x = 2$	12	7	$\Delta y = 2$
$\Delta x = 2$	14	9	$\Delta y = 2$

Your turn: Which data set is linear?

A

x	f(x)
0	0
1	1
2	1.4
3	1.7
4	2.0
5	2.2
6	2.4
7	2.6
8	2.8
9	3

B

x	g(x)
-4	32
-3	18
-2	8
-1	2
0	0
1	2
2	8
3	18
4	32

C

x	f(x)
-4	-7
-3	-5
-2	-3
-1	-1
0	1
1	3
2	5
3	7
4	9

Slope-intercept form of a linear equation:

the equation of a line written in the form:

$$y = f(x)$$

that gives the

slope of the line

and

the y -value where the graph crosses the y -axis.

$$y = mx + b$$

$$y = 3x + 2$$

Slope = 3 y -intercept: (0, 2)

Your turn: Is the data linear? If so, what is the equation that “fits” the data? $y = mx + b$

What does this number represent on the graph?

x	f(x)
-4	-7
-3	-5
-2	-3
-1	-1
0	1
1	3
2	5
3	7
4	9

The output value 'y' when input value x = 0.

$$y = m(0) + b \qquad y = b$$

The y-intercept always has an x-value of zero.

$$(0, b) \qquad b = 1$$

Substitute $b = 1$ into the general equation.

$$y = mx + 1$$

What is the slope?

$$m = \frac{\Delta y}{\Delta x} \qquad m = \frac{2}{1}$$

Substitute $m = 2$ into the general equation.

$$y = 2x + 1$$

$$\Delta x = 1 \qquad \Delta y = 2$$

Another way to do it:

$$y = mx + b$$

$$b = 1$$

$$y = mx + 1$$

x	f(x)
-4	-7
-3	-5
-2	-3
-1	-1
0	1
1	3
2	5
3	7
4	9

Every x-y pair is a solution of the equation → makes the equation true.

Substitute any x-y pair in for 'x' and 'y' in the equation.

$$3 = m(1) + 1$$

Solve for 'm'. $m = 2$

We know 'm' and 'b' → we know the equation that corresponds to the table.

$$y = 2x + 1$$

What is the equation of the line?

$$y = mx + b \quad b = 2$$

$$y = mx + 2$$

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

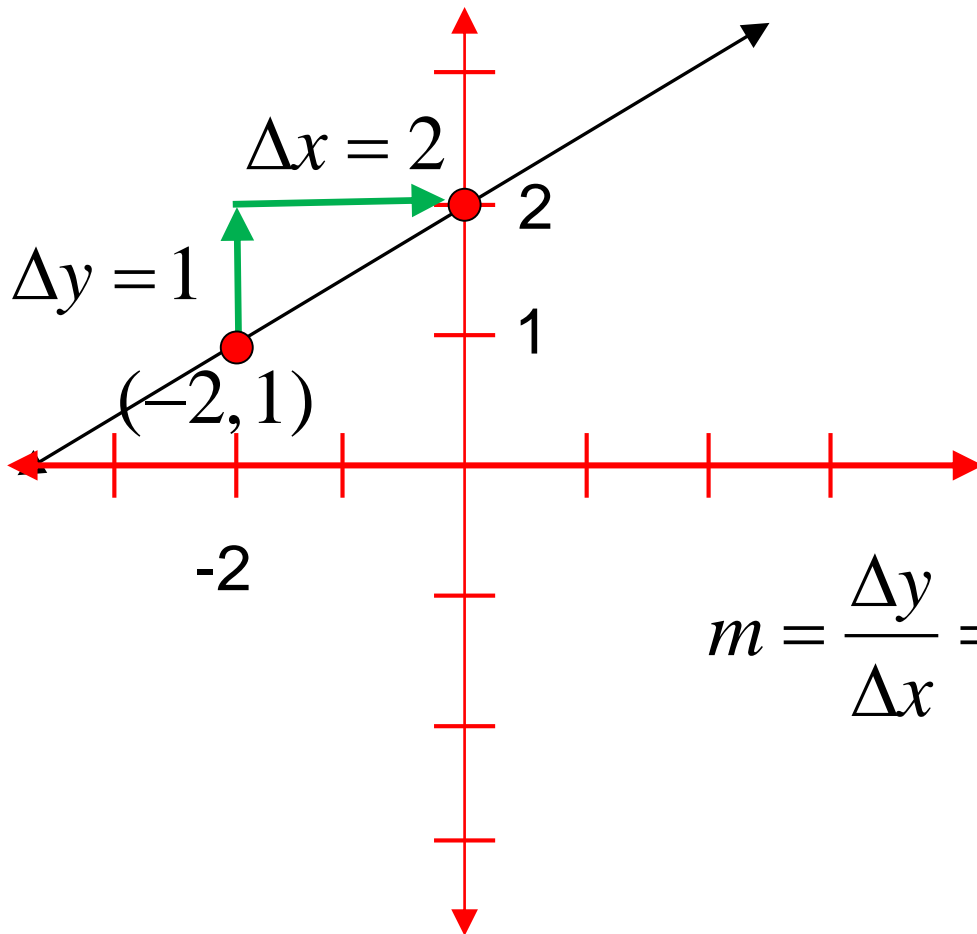
$$1 = m(-2) + 2$$

$$-1 = m(-2)$$

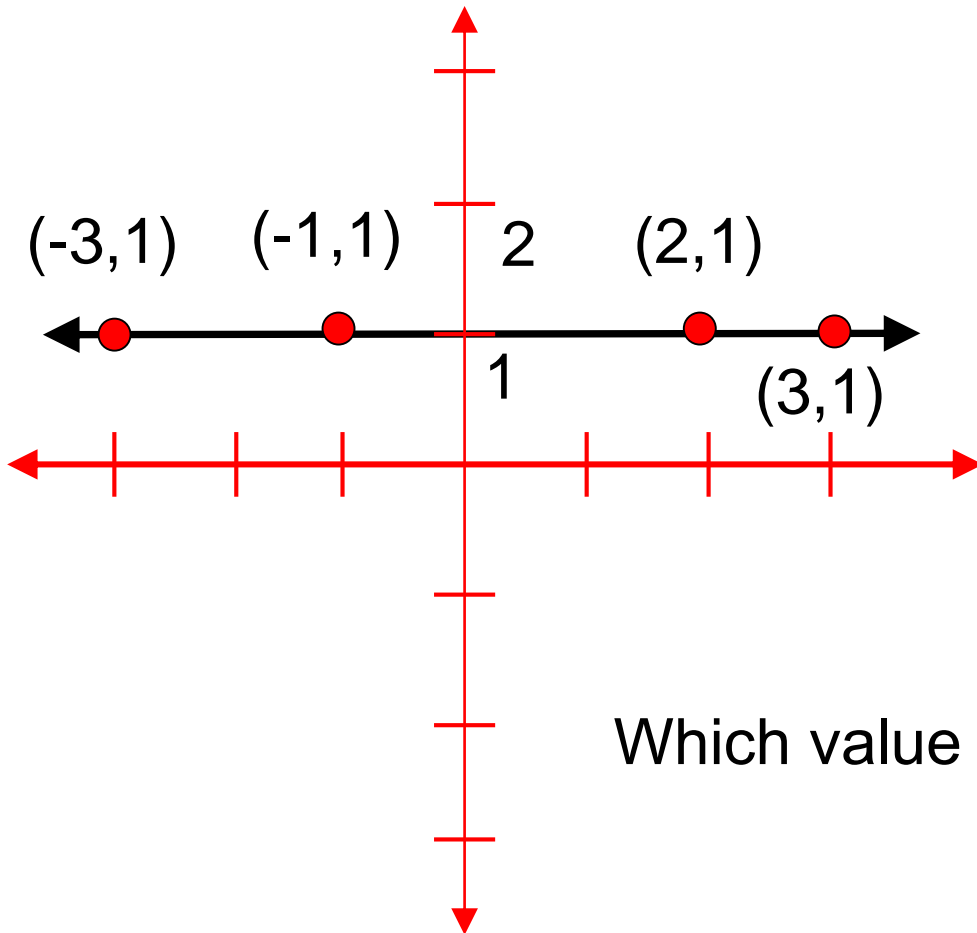
$$m = \frac{-1}{-2} = \frac{1}{2}$$

$$m = \frac{\Delta y}{\Delta x} = \frac{1}{2}$$

$$y = \frac{1}{2}x + 2$$



What is the equation of the line?



$$y = 1$$

or

$$x = 1$$

?

Which value (x or y) is always '1'?

Your turn: What is the equation that fits the data?

$$y = mx + b \quad b = -3$$

$$y = mx - 3$$

$$0 = m(2) - 3$$

$$m = \frac{3}{2}$$

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

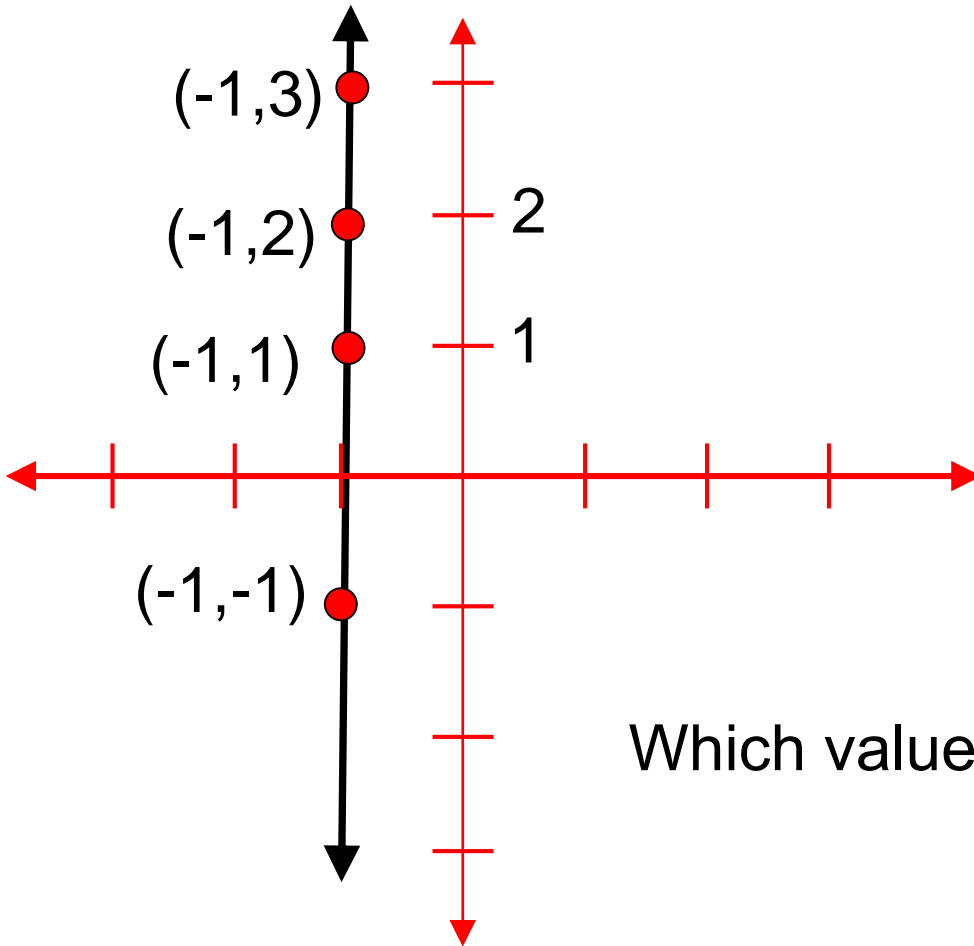
x	f(x)
-4	-9
-2	-6
0	-3
2	0
4	3
6	6
8	9
10	12
12	15

$\Delta x = 2$  $\Delta y = 3$ 

$$m = \frac{\Delta y}{\Delta x} = \frac{3}{2}$$

Your turn: What is the slope of the line that fits the data?

What is the equation of the line?



$$y = -1$$

or

$$x = -1$$

?

Which value (x or y) is always '-1'?

What is the equation of the line?

