NAME:_____ Math _____ , Period _____

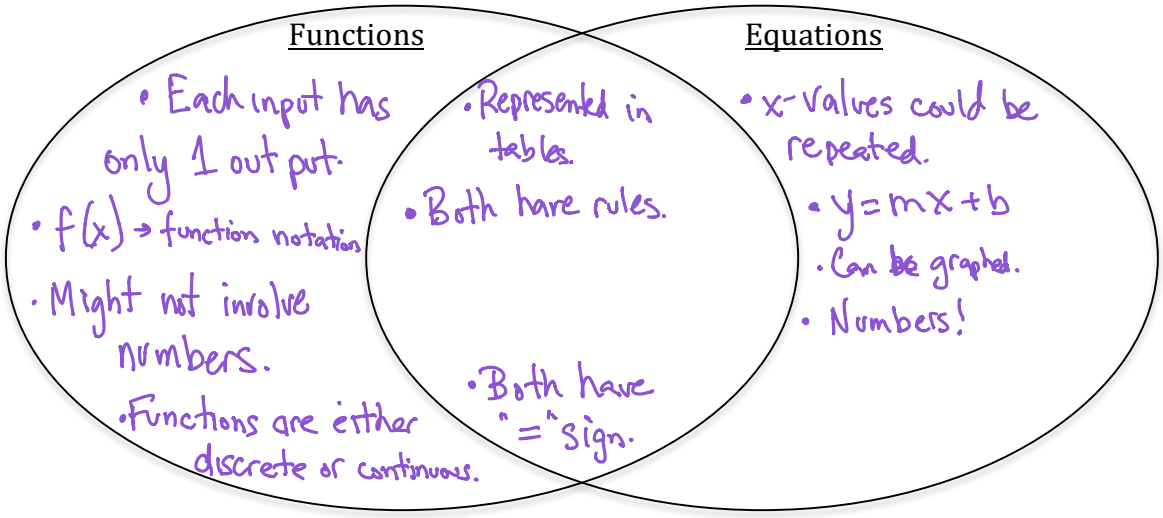
Mr. Rogove Date:_____

LEARNING OBJECTIVE: We will compare the graphs of functions and equations and will determine when a function is a linear function. (G8M5L5)

CONCEPT DEVELOPMENT:

Functions: A function is a rule that assigns each input exactly one output.
Stated another way: no x-values are repeated.

WHAT IS THE DIFFERENCE BETWEEN A FUNCTION AND AN EQUATION?



An equation can be used to define a function.

Example: If I begin the school year with 300 markers, and every week, we throw away (or lose) 12 markers, the number of markers I have at any given point is a function of how much time has passed. We can express this function as an equation: $y = 300 - 12x$ where y is the number of markers, and x is the number of weeks that have gone by.

$f(x) = 300 - 12x$

lbs	$
1	3
2	6
3	9
4	12

proportional

The **graph of a function** is the same as the graph of the equation that describes it. If a function is can be described by the equation $y = mx$, then the ordered pairs of the graph are (x, mx) and the graph of the function is the same as the graph of the equation.

$(x, y) \rightarrow y = 300 - 12x$ $\quad y = f(x)$

$(x, f(x))$ $f(x) = 300 - 12x$

NAME:_____ Math _____ , Period _____

Mr. Rogove Date:_____

OUR FOCUS IS ON LINEAR FUNCTIONS

Linear Functions: A function where the rule is specifically a linear equation in the form $y = mx + b$.

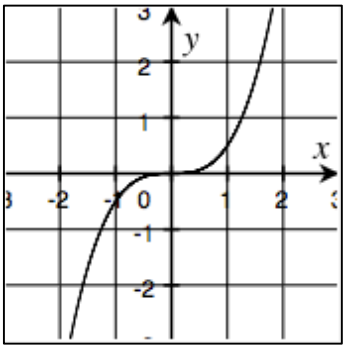
Example: I have $30 loaded on my Starbucks card, and each day I get a medium coffee for $2.00.

This linear function can be represented by the equation: $f(x) = -2x + 30$, where the amount of money I have remaining on my Starbucks card is a function of how many days I've bought a medium coffee.

1. Read these stories. Which are linear functions? Why?

a. I begin the year with $500 in my bank account, and each week, I deposit $25.	b. The number of people who use Twitter has been doubling every year.	c. I jumped out of an airplane, and I continued to gain speed going down toward the ground until I pulled the parachute cord.
Yes. The rate of change is constant. +25 Each week. $y = 25x + 500$.	No. The rate of change is NOT constant. $y = a2^x$ (EXPONENTIAL)	No! Rate of change is not change is not constant. > Speed up blc of gravity > Slow down blc of parachute

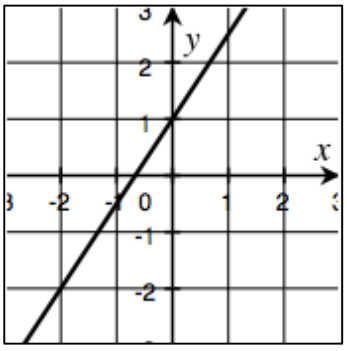
2. Look at these graphs. Which graphs represent linear functions?



No.

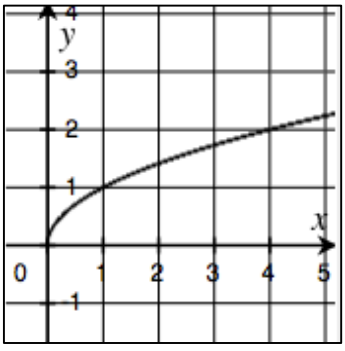
NOT STRAIGHT!

(CUBIC)



Yes.

STRAIGHT LINE!



No.

Not straight

(SQUARE ROOT)

NAME:_____ Math _____ , Period _____

Mr. Rogove Date:_____

3. Look at these equations. Which equations represent linear functions?

$y = -40x + 600$ YES. RATE OF CHANGE CONSTANT. x is raised to the 1st power.	→ $y = 3 + \frac{1}{5}x$ Yes. x is raised to 1st power	$y = x^2 - 1$ No! Because x is raised to 2nd power

4. Look at these tables. Which tables represent LINEAR functions?

Input	Output
2 (+2)	5 (+2)
4 (+1)	7 (+1)
5 (+3)	8 (+3)
8 (+2)	11 (+2)
10	13

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

Yes. RATE of CHANGE is CONSTANT.

Input	Output
2 (+1)	4 (+5)
3 (+1)	9 (+7)
4	16
5	25
6	36

No. $\frac{5}{1} \neq \frac{7}{1}$. Rate of change is

$y = x^2$ NOT constant

Input	Output
0	−3
1 (+1)	1 (+4)
2 (+1)	6 (+5)
3 (+1)	9 (+3)
4 (+1)	13 (+4)

No! $\frac{4}{1} \neq \frac{5}{1}$ RATE OF CHANGE IS NOT CONSTANT!!

HOW TO TELL IS A FUNCTION IS A LINEAR FUNCTION:

Stories: RATE OF CHANGE IS CONSTANT. ADD or SUBTRACT THE SAME QTY EACH TIME.

Graphs: STRAIGHT line

Equations: x raised to 1st power

Tables: CONSTANT RATE OF CHANGE

When rate of change is constant for pairs of inputs and their corresponding outputs, the function is a linear function.

NAME:_____ Math _____ , Period _____

Mr. Rogove Date:_____

Guided Practice:

Determining Linear Functions

1. Read the scenario carefully, study any tables/graphs, and equations.
2. Determine if your function is linear.
3. Answer any additional questions based on your knowledge of functions.

Study the table below.

Input	Output
3	9
9	17
12	21
15	25

Does this table represent a linear function? Check at least 3 pairs of inputs and their corresponding outputs.

$\frac{8}{6} = \frac{4}{3} = \frac{4}{3}$ Yes.

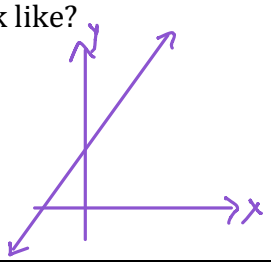
Rate of change is constant

$= \frac{4}{3}$

What equation could you use to describe this function?

$y = \frac{4}{3}x + 5$

If you graphed the function, what would the graph look like?



Study the table below.

Input	Output
1	2
2	−1
4	−7
6	−13

Does this table represent a linear function? Check at least 3 pairs of inputs and their corresponding outputs.

$\frac{-3}{1} = \frac{-6}{2} = \frac{-6}{2}$ Yes.

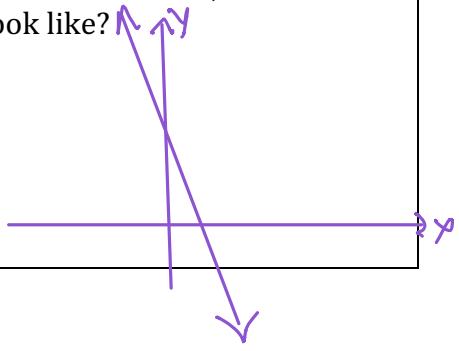
Rate of change is constant

$= -3$

What equation could you use to describe this function?

$y = -3x + 5$

If you graphed the function, what would the graph look like?



NAME:_____ Math _____ , Period _____

Mr. Rogove Date:_____

Study the table below.

Input	Output
−1	2
0	0
1	2
2	8
3	18

Does this table represent a linear function? Check at least 3 pairs of inputs and their corresponding outputs.

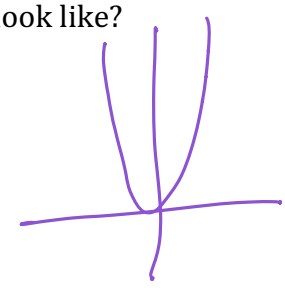
$\frac{-2}{1} \neq \frac{2}{1} \neq \frac{6}{1} \neq \frac{10}{1}$

Not linear!

What equation could you use to describe this function?

$y = 2x^2$

If you graphed the function, what would the graph look like?



Study the table below.

Input	Output
−2	4
3	9
4	16
4.5	20.25
5	25

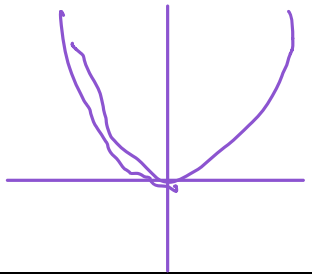
Does this table represent a linear function? Check at least 3 pairs of inputs and their corresponding outputs.

$\frac{5}{5} \neq \frac{7}{1}$ Not linear!

What equation could you use to describe this function?

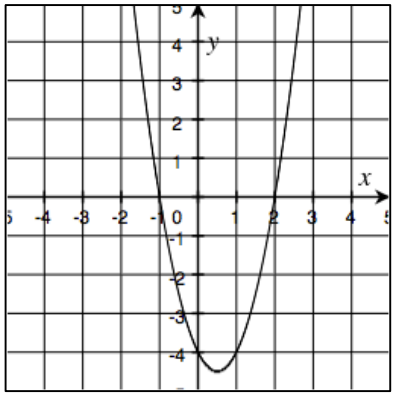
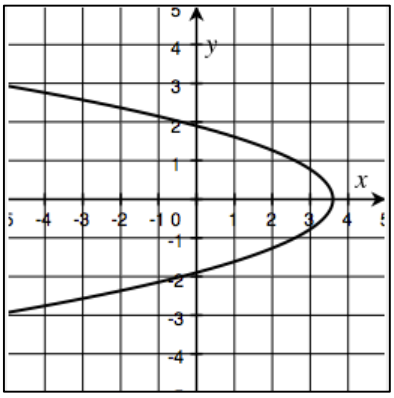
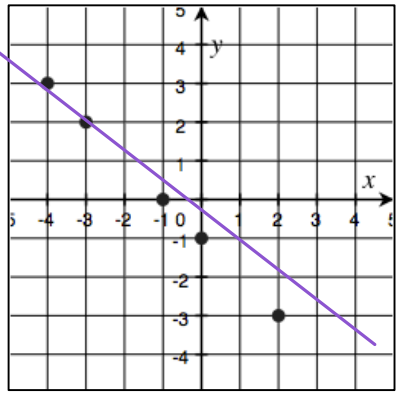
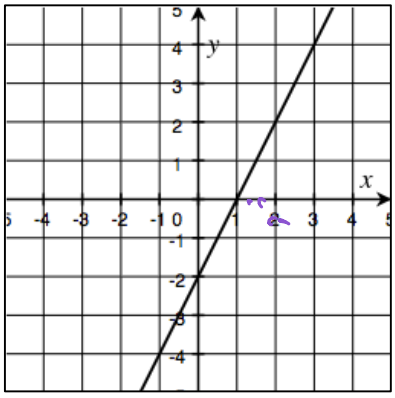
$y = x^2$

If you graphed the function, what would the graph look like?



NAME:_____ Math _____ , Period _____

Mr. Rogove Date:_____

Is the following a graph of a linear function?  No. Can you determine the equation for this function? $y=2(x+1)(x-2)$	Is the following a graph of a linear function?  No Can you determine the equation for this function? $x=-y^2+\frac{7}{2}$
Is the following a graph of a linear function?  Yes Can you determine the equation for this function?	Is the following a graph of a linear function?  Yes. Can you determine the equation for this function?

NAME:_____ Math _____ , Period _____

Mr. Rogove Date:_____

Independent Practice:

Question 3, 4, and 6 from the problem set can be independent practice.

Activating Prior Knowledge:

$3x + 2 = 5x + 6$	$6 - 4x = 10x + 9$	$5x + 2 = 9x - 18$
$4(5x + 6) = 4(3x + 2)$	$-2(-4x + 6) = -2(10x + 9)$	$8x + 2 - 3x = 7x - 18 + 2x$
$\frac{3x + 2}{6} = \frac{5x + 6}{6}$	$\frac{10x + 9}{5} = \frac{6 - 4x}{5}$	$\frac{2 + 5x}{3} = \frac{7x - 18 + 2x}{3}$

Closure:

Exit ticket Lesson 6 for closure.

Teacher Notes:

Map to Lesson 7, Mod 5.