SEL LESSON:

"Learn Like a Jungle Tiger"

WARMUP   **Created by Mr. Lischwe**

9/(*The age when you can buy a lottery ticket*)

Can you figure out the rules?   **(Week 7!!!)**

1)

Input	Output
Garage	g
Baboon	o
Function	o
Kayak	a
Dinosaur	u

Output = 2nd to last letter of input (the "penultimate" letter)

2)

Input	Output
Lischwe	2
Iowa	3
Pretzel	2
Mathematics	4
Equation	5

Output = # of vowels in the input

3)

Input	Output
Activity	1
Denver	4
Jupiter	10
Zipper	26
Friends	6

Output = Place in alphabet of the first letter of the input

4)

Input	Output
Lime	g
Stop Sign	r
Basketball	o
Sky	b
Banana	y

Output = First letter of the color of the input

PLAN FOR THIS WEEK

Today: More linear/nonlinear

Tomorrow: Review Functions

Wednesday: Functions Quiz

Thursday/Friday: Start Linear Functions Unit

EXTREMELY IMPORTANT PATTERN:

- If your outputs increase by a certain number, that is the "multiplying" number in the equation.
  - Outputs increase by 4 → Rule has a "4x"
  - Outputs decrease by 2 → Rule has a "-2x"

- NOTE: This only works if your <u>inputs</u> are consecutive numbers.

So, how does this help me with "guess my rule???"

- Guess <u>consecutive numbers</u>!!!

Can you get these rules???

1)

x	a(x)
1	4
2	7
3	10
4	13
5	16

a(x) = 3x + 1

2)

x	b(x)
5	15
6	20
7	25
8	30
9	35

b(x) = 5x – 10

3)

x	c(x)
-2	-7
-1	-5
0	-3
1	-1
2	1

c(x) = 2x – 3

4)

x	d(x)
0	10
1	6
2	2
3	-2
4	-6

d(x) = -4x + 10

One more…

x	f(x)
1	3
2	6
3	11
4	18
5	27

- **The "trick" does not work here, because the outputs do not increase by a constant amount.**
- **Tables like this have different types of equations that are NOT "times something plus or minus something"**
  - **Let's investigate a little further…**

Look at #1 on your Graphing Functions Sheet…

- Would our "trick" work for this one?

- The outputs are increasing by 2. And the equation has a "2x!"

- Based on the table, does it make sense why this graph would be a straight line?

NOTICE:

- #3 had a "$\frac{1}{2}x$" in the rule. And the inputs increase by ½.

- #5 had a "-3x" in the rule. And the inputs decrease by -3.

EXTREMELY IMPORTANT PATTERN:
- If your outputs increase by a certain number, that is the "multiplying" number in the equation.
  - Outputs increase by 4 → Rule has a "4x"
  - Outputs decrease by 2 → Rule has a "-2x"

- NOTE: This only works if your <u>inputs</u> are consecutive numbers.

- *****If this happens, your graph will be a straight line!!!*****

Look at the rest of the graphs…

- Look at the graphs that turned out to be <u>**straight lines**</u>, and the ones that were **NOT** straight lines.

- What was different about the equations that were not linear?

- What was different about the numbers in the table?

- **Let's explore what the graphs of different functions look like…**

- **https://www.desmos.com/calculator**

Linear or Nonlinear?

$$f(x) = x^3 + 4x - 3$$

Nonlinear

Linear or Nonlinear?

$$f(x) = 100 - x$$

Linear

Linear or Nonlinear?

$$f(x) = 5x - 2x$$

Linear

Linear or Nonlinear?

$$f(x) = -\frac{3}{4}x + \frac{1}{7}$$

Linear

Linear or Nonlinear?

$$f(x) = 4\sqrt{x} - 3$$

Nonlinear

Linear or Nonlinear?

$$f(x) = |2x + 10|$$

Nonlinear

Linear or Nonlinear?

$$f(x) = 6$$

Linear

Linear or Nonlinear?

$$f(x) = (4x - 3)^2$$

Nonlinear

Linear or Nonlinear?

$$6 - \frac{3}{4}x = f(x)$$

Linear

Linear or Nonlinear?

$$f(x) = 2x^3 - \sqrt{x} + |x - 4| + \frac{3}{x}$$

Nonlinear

Linear or Nonlinear?

$$y = 3x + \sqrt{2}$$

Linear

Linear or Nonlinear?

$$y = x(x - 4)$$

Nonlinear
(it will be $y = x^2 - 4x$)

Summarizing everything so far…

- Any equation with something like a "5x" will have outputs that increase by 5.

- This will also cause the graph to be a straight line (linear).

- Things like exponents, square roots, and absolute value make the outputs NOT have a constant increase.

- These graphs will NOT be a straight line.

KEY FEATURES OF GRAPHS

WHAT COULD BE SOME IMPORTANT THINGS ABOUT THIS GRAPH?
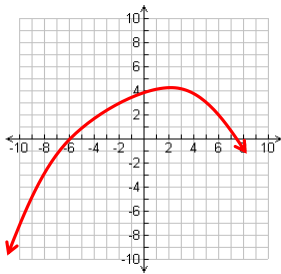
KEY FEATURES OF GRAPHS

Increasing: **Where the y-values go up (from left to right)**
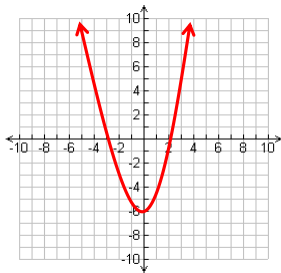**Decreasing:** **Where the y-values go down (from left to right)**
X-intercept: **Where the graph crosses the x-axis**
Y-intercept: **Where the graph crosses the y-axis**
Slope: **How steep the graph is**

ALWAYS READ A GRAPH FROM LEFT TO RIGHT!!!

KEY FEATURES?

X-intercepts: **-3 and 2**
Y-intercept: **-6**
Increasing/Decreasing?
 First decreasing, then increasing
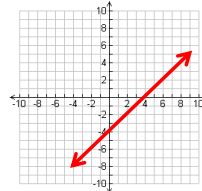

Increasing/Decreasing?   **Both increasing**
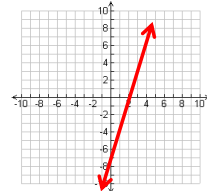
Which graph has a greater **x-intercept?**   **Graph 1**

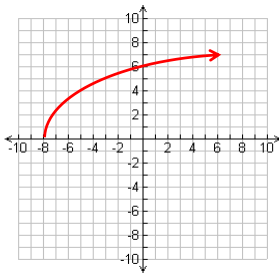Which graph has a greater **y-intercept?**   **Graph 1**
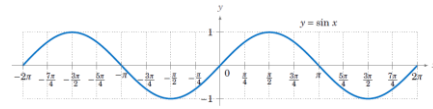
Which graph has a greater **slope?**   **Graph 2**

Graph 1   **Graph 2**

KEY FEATURES?

Increasing/decreasing?
Always increasing
X-intercept?
-8
Y-intercept?
6
Describe the **slope.**
The slope is not constant.

Above and beyond answer: the slope starts out very steep, then gets gradually less steep

KEY FEATURES?

Increasing/decreasing?
Increasing, then decreasing, then increasing, then decreasing, etc.
X-intercept?
$-2\pi, -\pi, 0, \pi, 2\pi$
Y-intercept?
0
Describe the **slope.**
The slope is not constant.

KEY FEATURES?
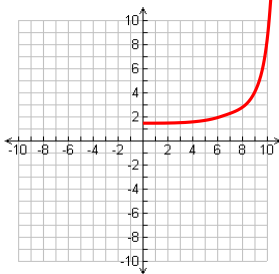
Increasing/decreasing?
Always increasing
X-intercept?
None
Y-intercept?
About 1.5
Describe the **slope.**
The slope is not constant. It starts not very steep, then gets steeper and steeper.

CHOOSE THE GRAPH THAT IS:

Decreasing, then increasing, then decreasing

Has an x-intercept of 4

A   **B**   **C**
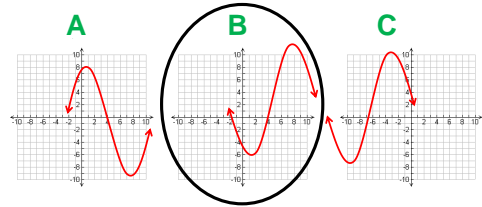
DRAW A GRAPH WITH THE FOLLOWING CHARACTERISTICS:

x and y-intercepts are both zero

Always decreasing

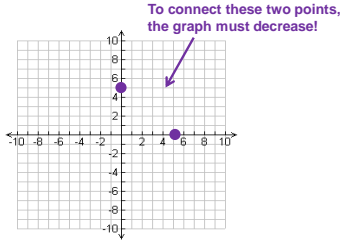**Slope doesn't change**

DRAW A GRAPH WITH THE FOLLOWING CHARACTERISTICS:

Always increasing

The slope changes

IS THIS POSSIBLE?

Draw a graph that is increasing, where the x-and y-intercept are both 5.

To connect these two points, the graph must decrease!

IMPOSSIBLE

WHICH OF THESE ARE POSSIBLE?

A) A graph that is increasing only, which has an x-intercept of -4 and a y-intercept of 6.

B) A graph that is increasing, then decreasing, has x-intercepts of 5 and -5, and a y-intercept of -9.

C) A graph that is increasing, then decreasing, then increasing again, that has x-intercepts of -8, 2, and 7, and a y-intercept of 4.

D) A graph that is decreasing, then increasing, that does not have an x-intercept.

All are possible except (B)

HOMEWORK: KEY FEATURES WORKSHEET