Can you figure out the rules?

| 1) | Input | Outpu | 2) | Input | Output | Output = \# of vowels in the input |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Garage | g |  | Lischwe | 2 |  |
|  | Baboon | Output $=2^{n d}$ to last letter of input (the "penultimate" letter) |  | lowa | 3 |  |
|  | Function |  |  | Pretzel | 2 |  |
|  | Kayak |  |  | Mathematics | 4 |  |
|  | Dinosaur | $u$ |  | Equation | 5 |  |
| 3) | Input | Output 4) |  | Input | Output | Output $=$ First letter of the color of the input |
|  | Activity | 1 | Output $=$ Place in alphabet of the first letter of the input | Lime | g |  |
|  | Denver | 4 |  | Stop Sign | r |  |
|  | Jupiter | 10 |  | Basketball | - |  |
|  | Zipper | 26 |  | Sky | b |  |
|  | Friends | 6 |  | Banana | y |  |

## GOING OVER THE <br> GRAPHING <br> WORKSHEET...

Table of Contents
p. 1 Consecutive Sums Project
p. 2 Stacking Cups Problem
p. 3 Converting Fractions and Decimals (1.1)
p. 4 Roots (1.8 \& 1.9)
p. 5 Rational vs. Irrational (1.1)
p. 6 What is a Function?
p. 7 Function Notation
p. 8 Graphing Functions
p. 9 Analyzing Key Features of Graphs

## ONE IMPORTANT THING TO NOTICE...

Did any of your graphs turn out to NOT BE FUNCTIONS?

Why do you think this happened???

Objectives:

## Analyzing Key Features of Graphs

-Compare linear/nonlinear equations
-Describe important "key features" of graphs

## OKAY, NOW LOOK BACK AT YOUR FUNCTION GRAPHS...

Look at the ones that are linear and the ones that are nonlinear

What do you think made them linear or nonlinear? Come up with some conjectures.

## Let's explore what the graphs of different functions look

 like...https://www.desmos.com/calculator

## COPY:

| Linear Equations | Nonlinear Equations |
| :--- | :--- |
| No exponent on the variable!!! | Exponents other than 1 |
| None of these other things: $\boldsymbol{\rightarrow}$ | Variable inside a square roots |
|  | Variable in a denominator |
|  | Variable inside an absolute value |

## LINEAR OR NONLINEAR?

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

## Linear

## LINEAR OR NONLINEAR?

## LINEAR OR NONLINEAR?

$$
f(x)=\frac{x}{5}+4
$$

Linear

## LINEAR OR <br> NONLINEAR?

$$
f(x)=\frac{6}{x}-2
$$

## Nonlinear

## LINEAR OR

 NONLINEAR?$$
f(x)=100=x
$$

## Linear

## LINEAR OR

NONLINEAR?

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

Linear

$$
\begin{aligned}
& \text { LINEAR OR } \\
& \text { NONLINEAR? } \\
& \qquad f(x)=x^{3}+4 x-3
\end{aligned}
$$

## Nonlinear

## LINEAR OR

NONLINEAR?

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

Linear

## LINEAR OR <br> NONLINEAR?

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

Nonlinear

## LINEAR OR <br> NONLINEAR?

$$
\begin{gathered}
f(x)=|2 x+10| \\
\text { Nonlinear }
\end{gathered}
$$

## LINEAR OR

 NONLINEAR?$$
f(x)=6
$$

Linear

## LINEAR OR

NONLINEAR?

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

## Nonlinear

## LINEAR OR

NONLINEAR?

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

## LINEAR OR

 NONLINEAR?$$
\begin{gathered}
6-\frac{3}{4} x=f(x) \\
\text { Linear }
\end{gathered}
$$

## LINEAR OR NONLINEAR?

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

Linear

## 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

## KEY FEATURES?



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

## 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.



## DRAW A GRAPH WITH <br> THE FOLLOWING CHARACTERISTICS:

$x$ and $y$-intercepts are both zero

Always decreasing

Slope doesn't change

## CHOOSE THE GRAPH THAT IS:

Decreasing, then increasing, then decreasing
Has an x -intercept of 4


## DRAW A GRAPH WITH <br> THE FOLLOWING CHARACTERISTICS:

## Always increasing

The slope changes

## IS THIS POSSIBLE?

Draw a graph that is increasing, where the x -and y -intercept

## 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 ay-intercept of 4.

## HOMEWORK

Key Features Half-Sheet

