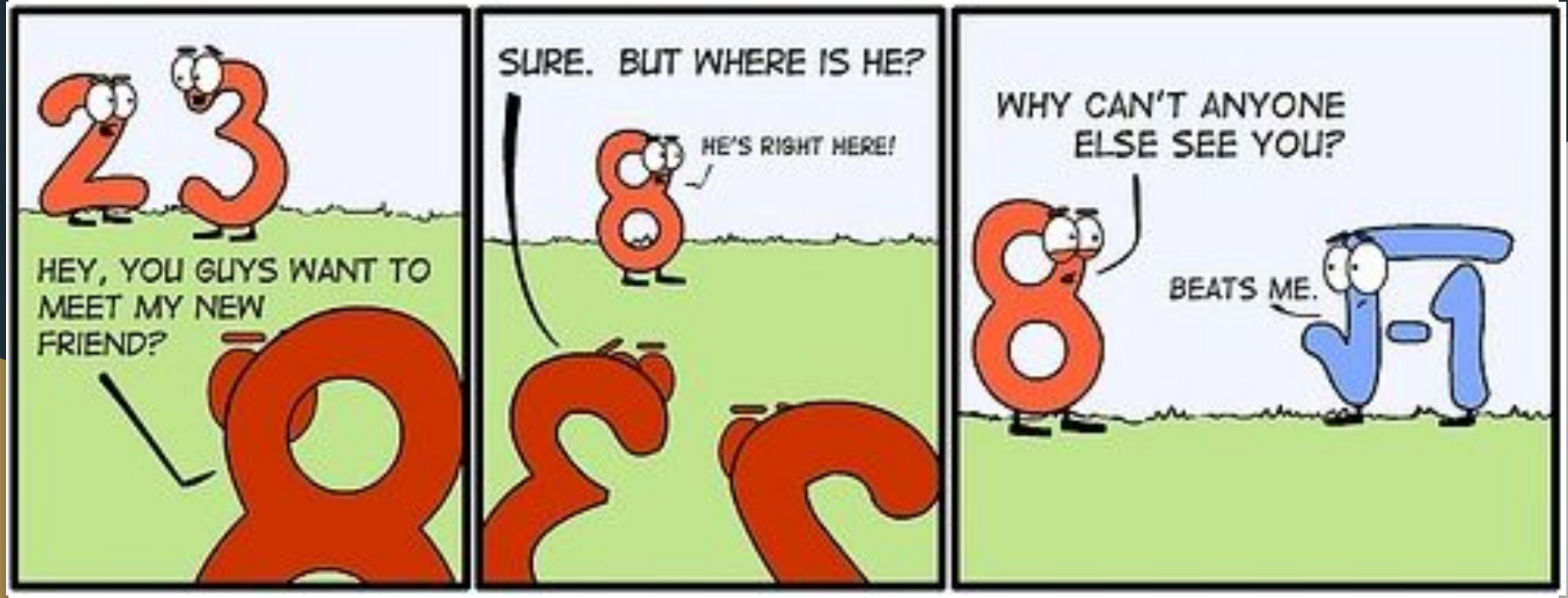
Warm-Up

Define the following:

1) Function
2) Linear Function
3) Nonlinear Function

Short discussion about “Imaginary Numbers” (Math 2 Standard! NOT tested in this class)

10/17/2018


HEY, YOU GUYS WANT TO MEET MY NEW FRIEND?
SURE. BUT WHERE IS HE?
HE'S RIGHT HERE!
WHY CAN'T ANYONE ELSE SEE YOU?
BEATS ME.

Patterns and Nonlinear Functions

10/17/2018

A **linear function** is a function that makes a straight line when graphed. Thus **non-linear** functions are any functions that are not linear. Graphing may be the quickest way to tell if a function is linear or non-linear, but we can also determine if a function is linear from its input/output table or equation.

This can be seen in the input/output table in that there is a constant difference in the dependent variable values. In other words, when the independent variable increases by one, the dependent variable will always increase or decrease the same amount. Let's look at our three linear tables again.

t	-2	-1	0	1	2
c	1	1	3	5	7

+2 +2 +2 +2

w	-2	-1	0	1	2
s	1	$.5$	0	$.5$	1

+.5 +.5 +.5 +.5

d	-2	-1	0	1	2
h	3	4	5	6	7

+1 +1 +1 +1

Notice that the first table has a constant difference of two, meaning that as t increases by one, c increases by two every time. The second table has a constant difference of half, and the third table has a constant difference of one.

Alternately, notice that all three equations have the independent variable only to the first power. Meaning there is no exponent showing with the variable. That also means they are linear functions.

$$c = 2t + 3 \qquad s = \frac{1}{2}w \qquad h = d + 5$$

Check the non-linear functions given on the previous page and see that they are not a straight line when graphed, have no constant difference, and have exponents in their equation.

In general, anything of the form $y = mx + b$ is considered a **linear function** where m is the slope and b is called the y-intercept. Notice that the x has an unwritten exponent of one with it.

There are times when a linear function is not given in slope-intercept form. (That's what we call $y = mx + b$.) Sometimes a linear function is given in standard form which is $Ax + By = C$. However, since the exponent on the x variable is still a one, we can get it in slope intercept form. For example, consider the following:

$$2x + 3y = 6$$

$$2x + 3y - 2x = 6 - 2x$$

$$3y = -2x + 6$$

$$\frac{3y}{3} = \frac{-2x + 6}{3}$$

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

So the big picture… we can tell if a function is linear by…

Chart/Table:

Equation:

Graph:

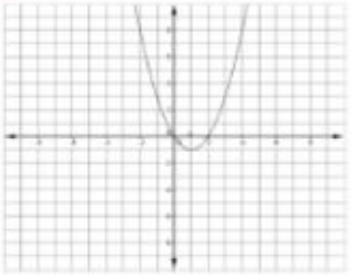
Partner Practice

Select a partner to work with and access the practice problems that are posted on the next few slides. (You can find these slides on my website!) If you have any trouble, I will be circulating to answer any questions.

Function	Linear/Nonlinear
$y = -6x + 8$	
$y = 3x^2 - 1$	
$y = 1 - \frac{3}{5}x$	
$y = 3.2$	
$y = \frac{x^3}{2} + 9x$	
$y = 12x$	
$y = \frac{1}{2}$	
$y = -7x - 1$	
$y = 6x - \frac{2}{5}$	
$y = x^2 + x - 4$	

Determine whether the following functions are linear or non-linear and explain how you know.

1.



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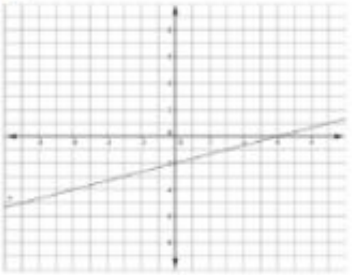

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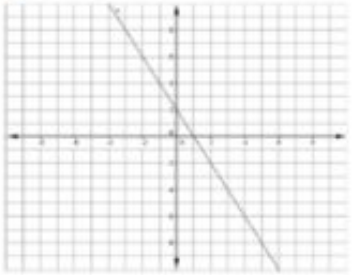

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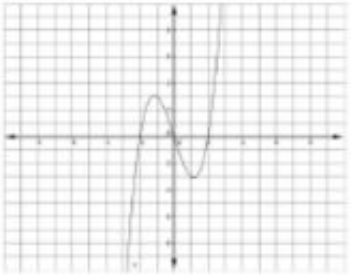

5. $5x + 3y = 0$

6. $y - 4x = -5$

7. $y = \sqrt{x+9}$

8. $y = 3^x - 2$

9.

x	-2	-1	0	1	2
y	-12	-2	0	0	4

10.

x	-2	-1	0	1	2
y	-13	-10	-7	-4	-1

11.

x	-5	0	5	10	15
y	1	3	5	7	9

12.

x	2	3	6	11	18
y	0	1	2	3	4

Homework

Worksheet posted on website (you will need your graphing calculator!)

Also

Textbook Page 250 #6-12