Happy Tuesday, January 10th!

Do Now: $2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2$

How many times do you have to multiply 2 by itself to get 128?

$2^7 = 128$ $2 \bullet 2 \bullet 2 \ldots = 128$ 7 times

Jan 7-6:38 PM

Today's Agenda:

- Finish Notes from yesterday

- Introduce Logarithms

Materials Needed:

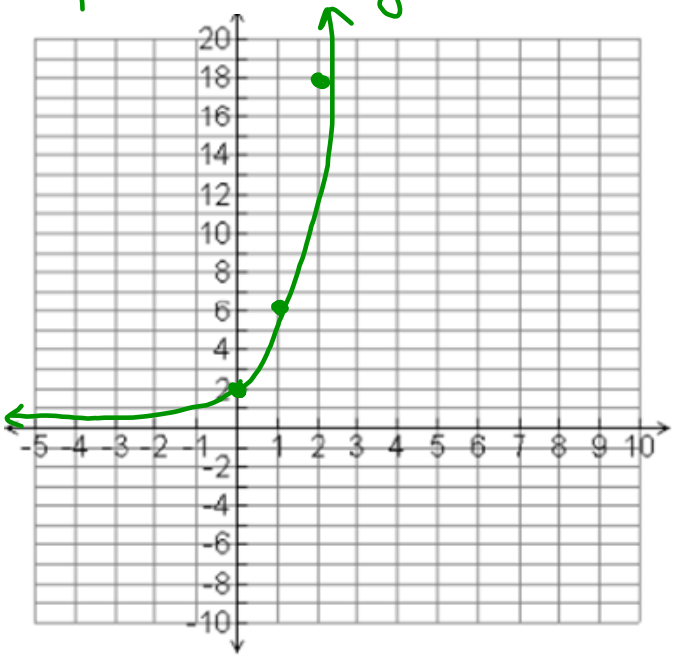
- Pen/pencil, Notebook/paper, "What is a logarithm" worksheet

Jan 10-7:30 AM

## Let's explore some expoential growth and decay functions.

Ex 2: $y = 2(3)^x$ $3^0 = 1$ exponential growth

| X | Y |
|---|---|
| -1 | |
| 0 | 2 |
| 1 | 6 |
| 2 | 18 |
| 3 | |

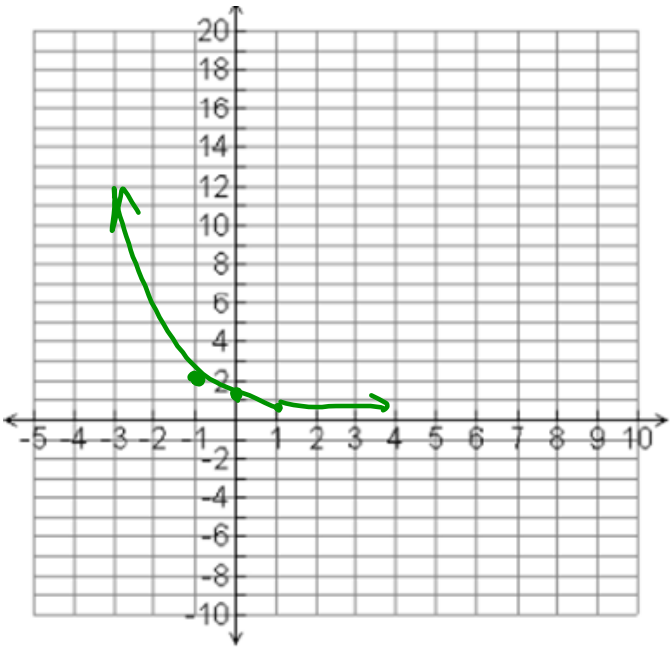


Jan 7-1:45 PM

## Let's explore some expoential growth and decay functions.

Ex 3: $y = 1\left(\frac{1}{2}\right)^x$

| X | Y |
|---|---|
| -2 | |
| -1 | 2 |
| 0 | 1 |
| 1 | $\frac{1}{2}$ |
| 2 | |



Jan 7-1:45 PM

*positive Let's compare the equations:

* y values greater

$y = 2(3)^x$

Exponential Growth

* not a fraction

$y = 1\left(\frac{1}{2}\right)^x$

Exponential Decay

Jan 10-7:39 AM

## Exponential Decay

Decay

$y = a(b)^x$

When a >0 and b is between 0 and 1 the graph will:

## Exponential Growth

Growth

$y = a(b)^x$

When a >0 and b is greater than 1 the graph will:

Jan 10-7:39 AM

$y = 3(6)^x$

because 3 pos.
$6 > 1$
Growth

$y = 3\left(\frac{3}{2}\right)^x$

$1\frac{1}{2}$ Growth

$y = 2(0.4)^x$

Jan 10-10:36 AM

U3IF1: I can apply properties of logarithms

Logarithmic Form $\log_b a = c$ (argument, exponent, base)

Exponential Form $b^c = a$ (exponent, argument, base)

Jan 10-7:42 AM

$2 \bullet 2 \bullet 2 \ldots = 128$

$\log_2 128 = ?$

$2^{?} = 128$

Jan 10-7:43 AM

$3^x = 9$

$3^x = \frac{1}{3}$

$3^x = -6$

$\log_3 9 = 2$

$\log_3 \frac{1}{3} = -1$

$\log_3 -6 = \emptyset$

$3^{-2} = \frac{1}{3^2} = \frac{1}{9}$

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

Jan 10-7:46 AM

$15^x = 1$

$\log_{15} 1 = 0$

Any number raised to the 0 power is 1.

$9^x = \frac{1}{81}$

$\log_9 \frac{1}{81} = -2$

Jan 10-7:47 AM

## On your notesheet:

Practice finding the value of the logarithms below:

1) $\log_2 8 = 3$
Think: What exponent can I raise the base (2) to, to get 8?
$2^3 = 8$

2) $\log_3 9 = 2$
Think: What exponent can I raise the base 3 to, to get 9?
$3^2 = 9$

3) $\log_{4} \frac{1}{4} = -1$
Think: What exponent can I raise 4 to, to get $\frac{1}{4}$?

4) $\log_5 -25$ = No Solution
Think: What exp. can I raise 5 to, to -25?
$5 \cdot 5 \cdot 5 \cdot 5$

Jan 10-7:55 AM

We are rewriting exponents!!

Rewrite the following in exponential form:

5) $\log_3 81 = 4$ $3^4 = 81$

base: 3 a=81
exp: 4

6) $\log_2 \frac{1}{8} = -3$ $2^{-3} = \frac{1}{8}$

Rewrite the following in logarithmic form:

7) $5^2 = 25$ $\log_5 25 = 2$

8) $4^{-2} = \frac{1}{16}$ $\log_4 \frac{1}{16} = -2$

Jan 10-7:57 AM

$\log_{10} 10000 = 4$ $10^4 = 10,000$

What exp. do I raise 10 to, to get 10,000

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Homework: Back of notes

Exit Slip: Find the value of the logarithm

$$\log_6 216 = ?$$

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