LEARNING LOGARITHMS WITH POOGLE

I LOVE MATH!!!

HELLO, I AM POOGLE.
AND I AM HERE TO TEACH LOG.

MY NICKNAME IS POOGLE-GOOGLE.
YOU CAN ASK ANYTHING WHAT YOU WANT TO KNOW.

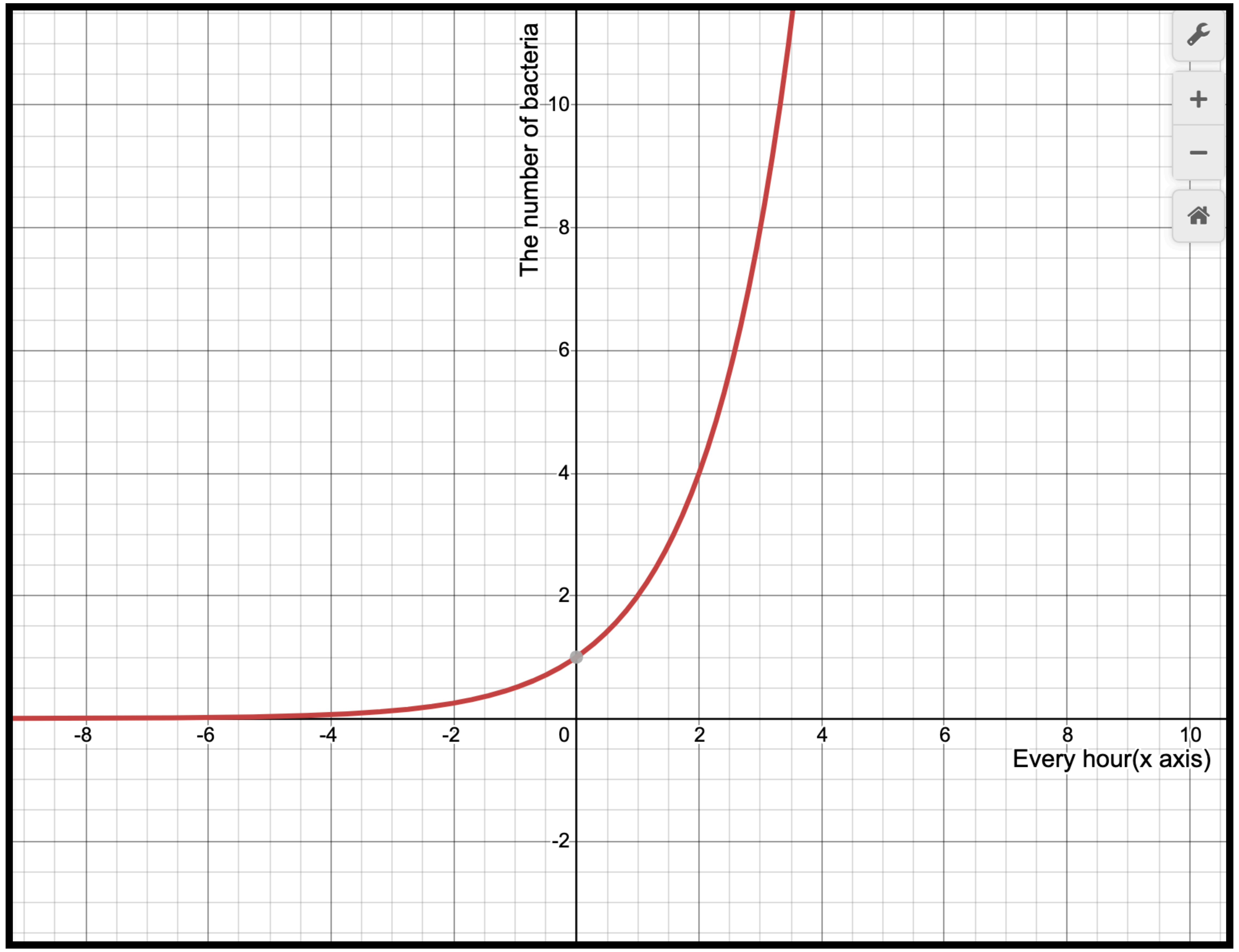
Ms. Poogle
- Professional Math Teacher @ VHS
- The first non-human being certified for teaching mathematics at high school

WHAT IS AN EXPONENTIAL FUNCTION?

Owing to social distancing to prevent coronavirus which is going on from last year, the people under stress has grown exponentially. Just like the phrase, if the graph continues, an exponential function grows or shrinks exponentially.

Exponential functions have the form $f(x) = b^x$, where b > 0 and b ≠ 1. Just as in any exponential expression, b is called the base and x is called the exponent.

LOOKING AT THE EXPONENTIAL FUNCTION



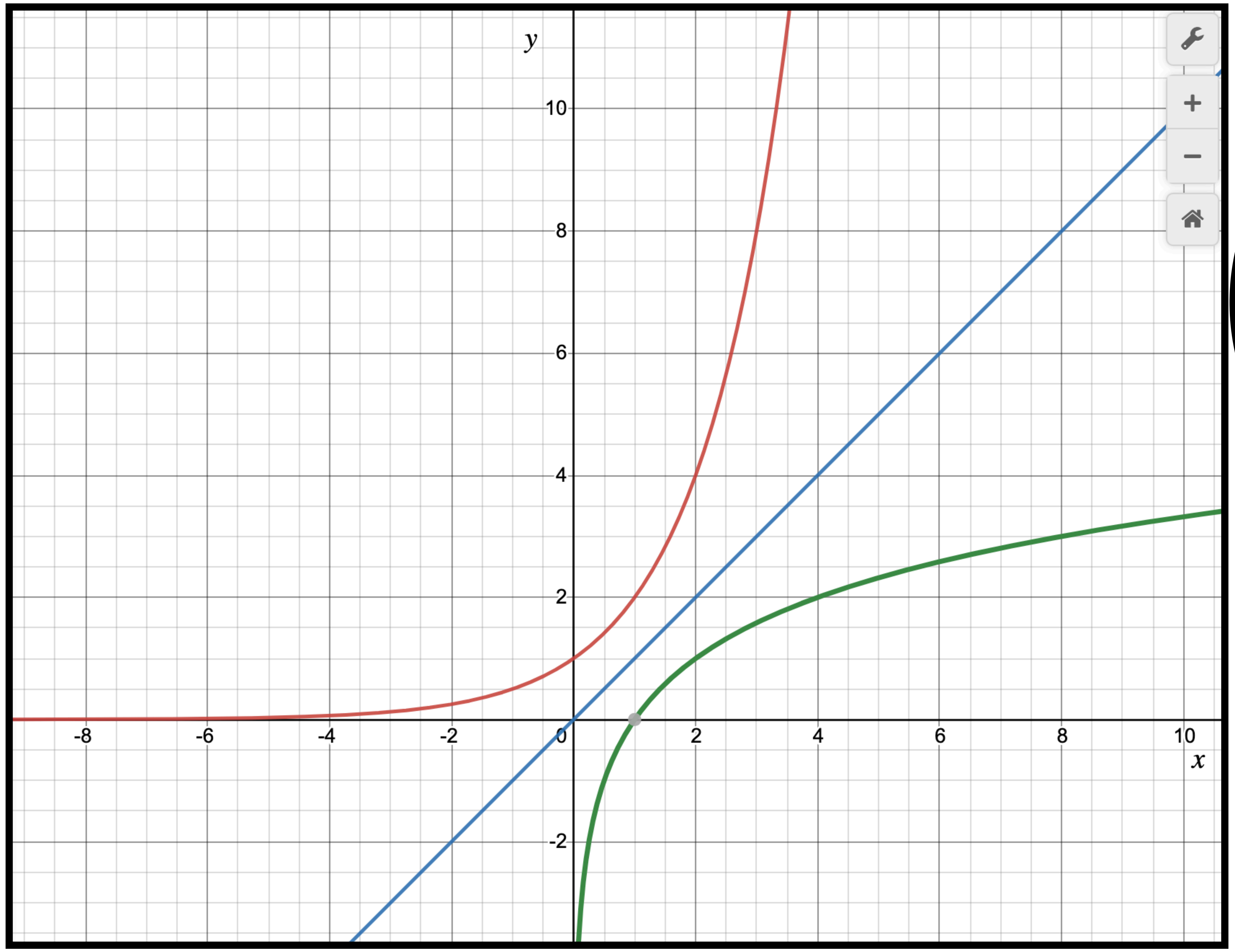
TAKE THE EXAMPLE OF THE GROWTH OF VACTERIA.
SOME BACTERIA DOUBLE EVERY HOUR.
IF YOU START WITH I BACTERIUM AND IT DOUBLES EVERY HOUR, YOU WILL HAVE 2^x BACTERIA AFTER X HOURS. THIS CAN BE WRITTEN AS...

$$y = 2^x$$

WHAT IS AN LOGARITHMIC FUNCTION?

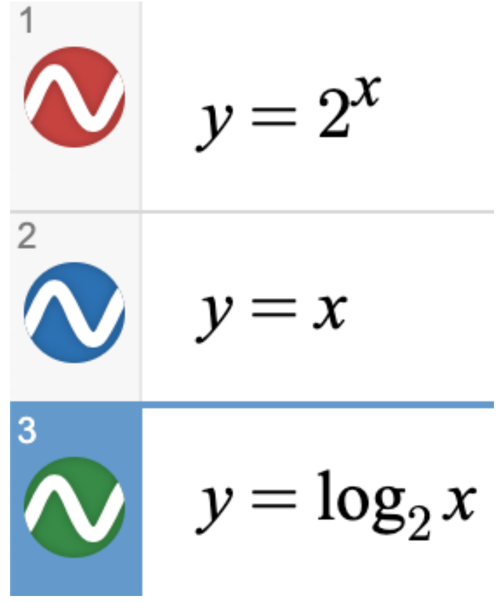
Logarithmic functions are the inverses of exponential functions, and any exponential function can be expressed in logarithmic form. Similarly, all logarithmic functions can be rewritten in exponential form. For an exponential function written as: $x = b^y$, the logarithmic notation will be: $y = log_b x$

LOOKING AT LOGARITHMIC FUNCTION



THE INVERSE OF THE EXPONENTIAL FUNCTION, $f(x) = 2^x$, IS THE LOGARITHMIC FUNCTION $f(x) = log_2 x$.

THE EXPONENTIAL FUNCTION AND LOGARITHMIC FUNCTION ARE REFLECTED OVER THE LINE $y = x$.



LOGARITHMIC PROPERTIES

LET US LOOK AT THE MOST IMPORTANT FOUR PROPERTIES!

$$log_b x = y \quad \rightarrow \quad b^y = x$$

$$log_a b + log_a c = log_a b \times c$$

$$log_a b - log_a c = log_a b \div c$$

$$log_a b^c = c \times log_a b$$

THE FIRST PROPERTY

DEMONSTRATING THE FIRST PROPERTY IS SO EASY.

IF YOU ORDER THE FUNCTIONS IN CORRECT ORDER, LOGARITHMIC AND AND EXPONENTIAL FUNCTIONS ARE INTERCHANGEABLE.

$$log_b x = y \rightarrow b^y = x$$

LET ⟨B⟩ BE 5, LET ⟨X⟩ BE 5, LET ⟨Y⟩ BE 1.

$$log_5 5 = 1 \rightarrow 5^1 = 5$$

$$1 = 1 \rightarrow 5 = 5$$

TRUE!!!!!!!

THE FIRST PROPERTY

HERE IS TIP FOR YOU KIDS!
HOW TO TURN A LOGARITHMIC FUNCTION INTO EXPONENTIAL FUNCTION?

$$\log_a b = c \longrightarrow a^c = b$$

$$\log_3 9 = 2 \longrightarrow 3^2 = 9$$

$$4^2 = 16 \longrightarrow \log_4 16 = 2$$

Logarithmic -> Exponential:

1. Base -> Base
2. Solution -> Exponent
3. Argument -> Solution

Exponential -> Logarithmic:

1. Base -> Base
2. Solution -> Argument
3. Exponent -> Solution

THE SECOND PROPERTY

YOU CAN ADD TWO LOGS BY MULTIPLYING THEIR ARGUMENTS ONLY IF WHEN TWO LOGS HAVE THE SAME BASE!

$$log_aB + log_aC = log_aB \times C$$

LET <A> BE 3, LET <B> BE 27, LET <C> BE 81.

$$log_3 27 + log_3 81 = log_3 27 \times 81$$

$$log_3 27 + log_3 81 = log_3 2187$$

$$3 + 4 = 7$$

TRUE!!!!!!!

THE THIRD PROPERTY

YOU CAN ADD TWO LOGS BY SUBTRACTING THEIR ARGUMENTS ONLY IF WHEN TWO LOGS HAVE THE SAME BASE!

$$log_a B - log_a C = log_a B \div C$$

LET <A> BE 3, LET <B> BE 27, LET <C> BE 81.

$$log_3 81 - log_3 27 = log_3 81 \div 27$$

$$log_3 81 - log_3 27 = log_3 3$$

$$4 - 3 = 1$$

TRUE!!!!!!!

THE FOURTH PROPERTY

IF THERE'S A LOG WHERE THE ARGUMENT HAS AN EXPONENT, MOVE IT OUT TO THE FRONT!

$$log_aB^c = C \times log_aB$$

LET ⟨A⟩ BE 3, LET ⟨B⟩ BE 9, LET ⟨C⟩ BE 2.

$$log_3 3^2 = 2 \times log_3 3$$

$$2 = 2$$

TRUE!!!!!!!

IDEA FROM POOGLE

HISTORY OF LOGARITHMS

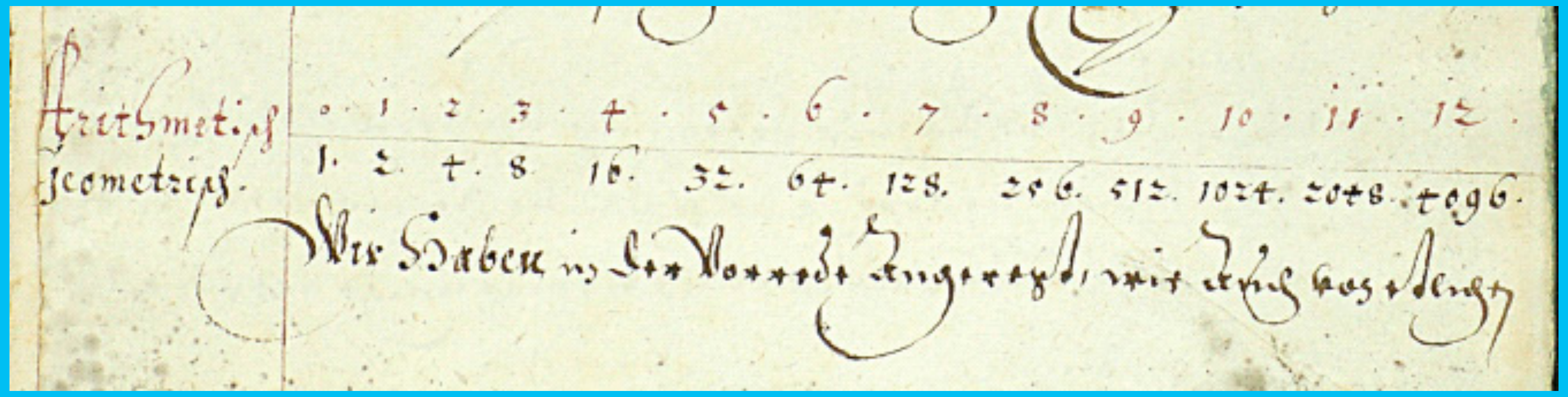
Let us explore what logarithm is in history level. Attention please!

JOHN NAPIER

- The system of natural logarithms was first published in 1614 by John Napier, a Scottish mathematician, in his book Mirifici Logarithmorum Canonis Descriptio (Description of the Wonderful Rule of Logarithms). Napier coined the term.
- He created logarithms to aid his computation by speeding up calculations, especially the multiplication of quantities known as sines at the time.
- For more than 300 years, Napier's logarithms were an important application for numerical work, before automatic calculating machines took over in the late 19th century.

JOOST BÜRGI

- Joost Bürgi, the founder of logarithm, was born in February 1552 in Switzerland and died in 1632.
- He worked as a specialist court clock maker and was Johannes Kepler's assistant.
- He made contributions in the areas of decimal fractions, exponential notation, an antilogarithm map, and a geometric approach to logarithms.
- Bürgi's table, on the other hand, was produced in 1588, but he did not publish it until Napier did.



Part of Bürgi's work on logarithm creation

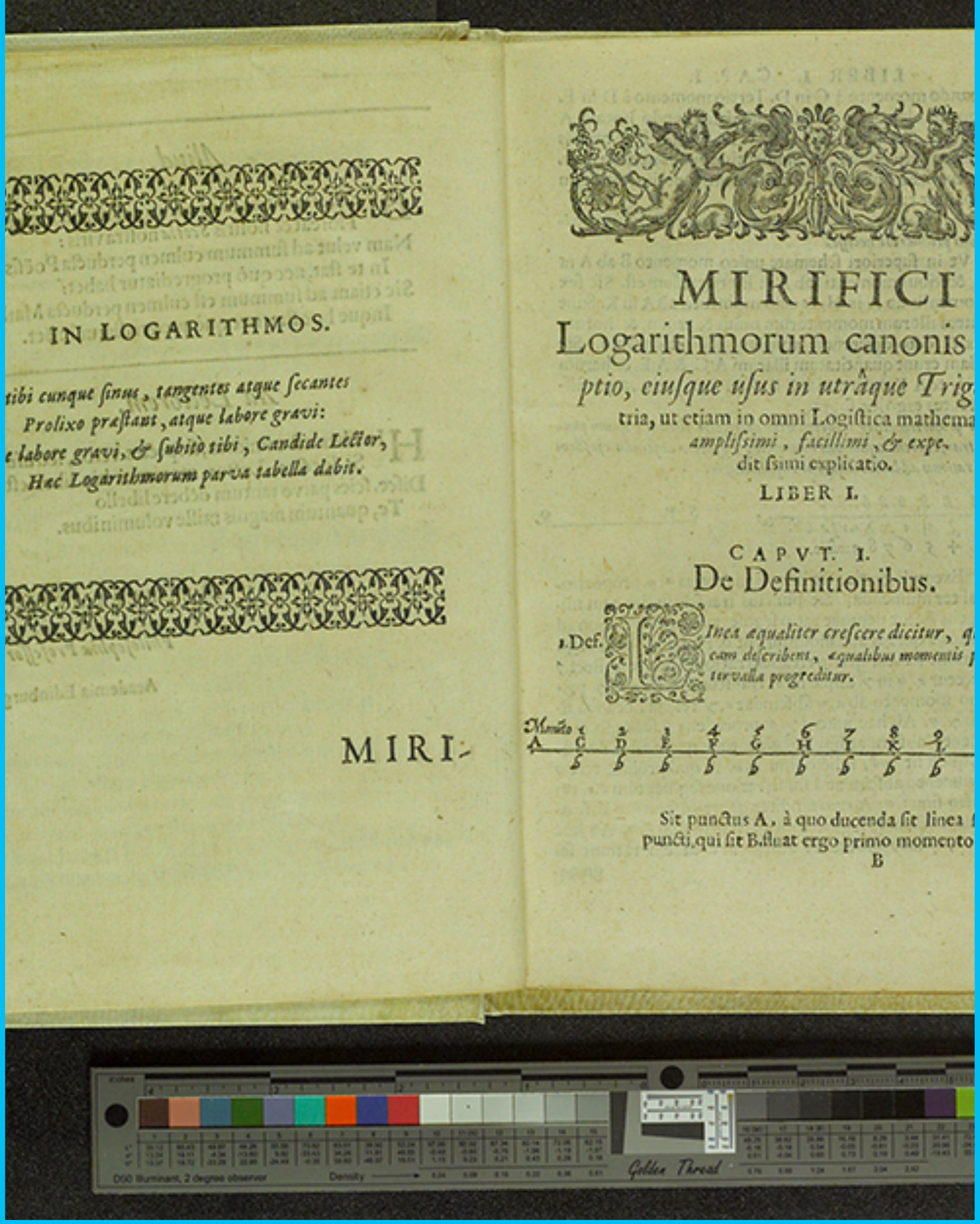
“WHY DID NAPIER MAKE LOGARITHM?”

THOSE WHO GUESS WELL WOULD GET ONE CHOCOLATE.

QUESTION:

WHY DID NAPIER MAKE LOGARITHM?

- Napier was motivated to create logarithm by his interest in astronomy.
- He decided to make complicated trigonometry calculations in astronomy easier to understand.
- However, Napier's logarithm is not the same as the one we use now.

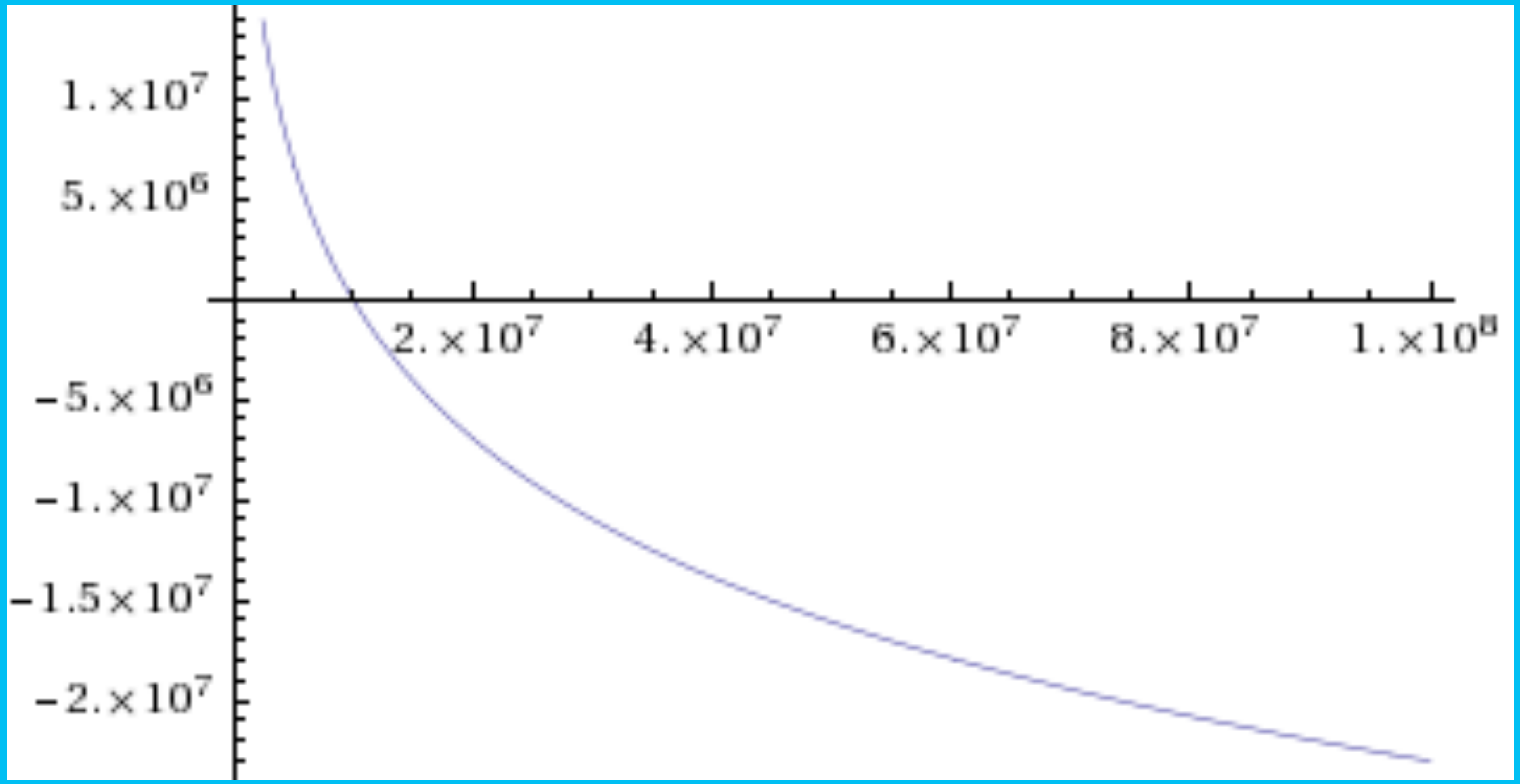


Mirifici Logarithmorum Canonis Descriptio

INTERESTING FACTS:

PROPERTIES OF NAPIERIAN LOGARITHM

- He used logarithm base, e (approximately 2.718)
- The system used constant of 10^7.
- The ratio of two distances were in a geometric form.



https://en.wikipedia.org/wiki/Napierian_logarithm

MORE CONTRIBUTORS…

HENRY BRIGGS

- Henry Briggs, the inventor of the common logarithm, was born in 1561 and died in 1630 in England.
- He was a professor of mathematics at the University of Oxford.
- Briggs partnered with Napier to change the Naperian logarithm in 1615-1616.
- To honor his work, the common logarithm is also known as the Briggsian logarithm.
- He suggested that instead of e, log base 10 be used, and he released logs n = 1 1000 to 14 dp.

APPLICATIONS OF LOGARITHMIC FUNCTIONS ?

THINK ABOUT IT AND RAISE YOUR HANDS. GET A CHOCOLATE.

LOGARITHMIC FUNCTIONS HAVE MANY REAL WORLD APPLICATIONS

The pH Scale and Acidity

The Richter Scale and Earthquakes

The Decibel Scale and Sound Intensity

Development and reduction in the population

Half-Life of Compound Interest in Carbon Dating

...

But not limited to the aforementioned topics.

EXAMPLE HERE! SOUND INTENSITY

$$L = 10log(\frac{I}{I_o})$$

L is the decibel level of the tone (dB)
I = the sound volume that is being measured
Io = the reference sound's amplitude to which the measured sound is being compared

EXAMPLE HERE! SOUND INTENSITY

- VHS student A has a noise rating of 50 decibels during his sleep. The roommate B, however, has a noise rating of 90 decibels. How many times more intense is the noise of the B when compared to the A?
- Another chocolate giveaway chance for those who have found the answer of this question!

EXAMPLE HERE! SOUND INTENSITY

- Let “L1” represent the loudness of the student B and “I1” represent the sound intensity of the student B. Let “L2” represent the loudness of the student A and “I2” represent the sound intensity of the student A.
- Remember that the default base of a log is “10”!

$$L_1 - L_2 = 10 \cdot log(\frac{I_1}{I_2})$$

$$90 - 50 = 10 \cdot log(\frac{I_1}{I_2})$$

$$40 = 10 \cdot log(\frac{I_1}{I_2})$$

$$4 = log(\frac{I_1}{I_2})$$

$$10^4 = \frac{I_1}{I_2}$$

$$10000 = \frac{I_1}{I_2}$$

$$I_1 = 10000(I_2)$$

ANSWER IS …
"THE LOUDNESS OF THE STUDENT B IS 10,000 TIMES MORE INTENSE THAN THE STUDENT A."

WHO GOT CORRECT? WHO GET CHOCOLATE? WHO IS THE WINNER?

WHAT WE LEARNED IN THIS CLASS

HISTORY OF LOGARITHM

Joost Bürgi, John Napier and Henry Briggs

PROPERTIES OF LOGARITHM AND EXPONENTIAL FUNCTIONS

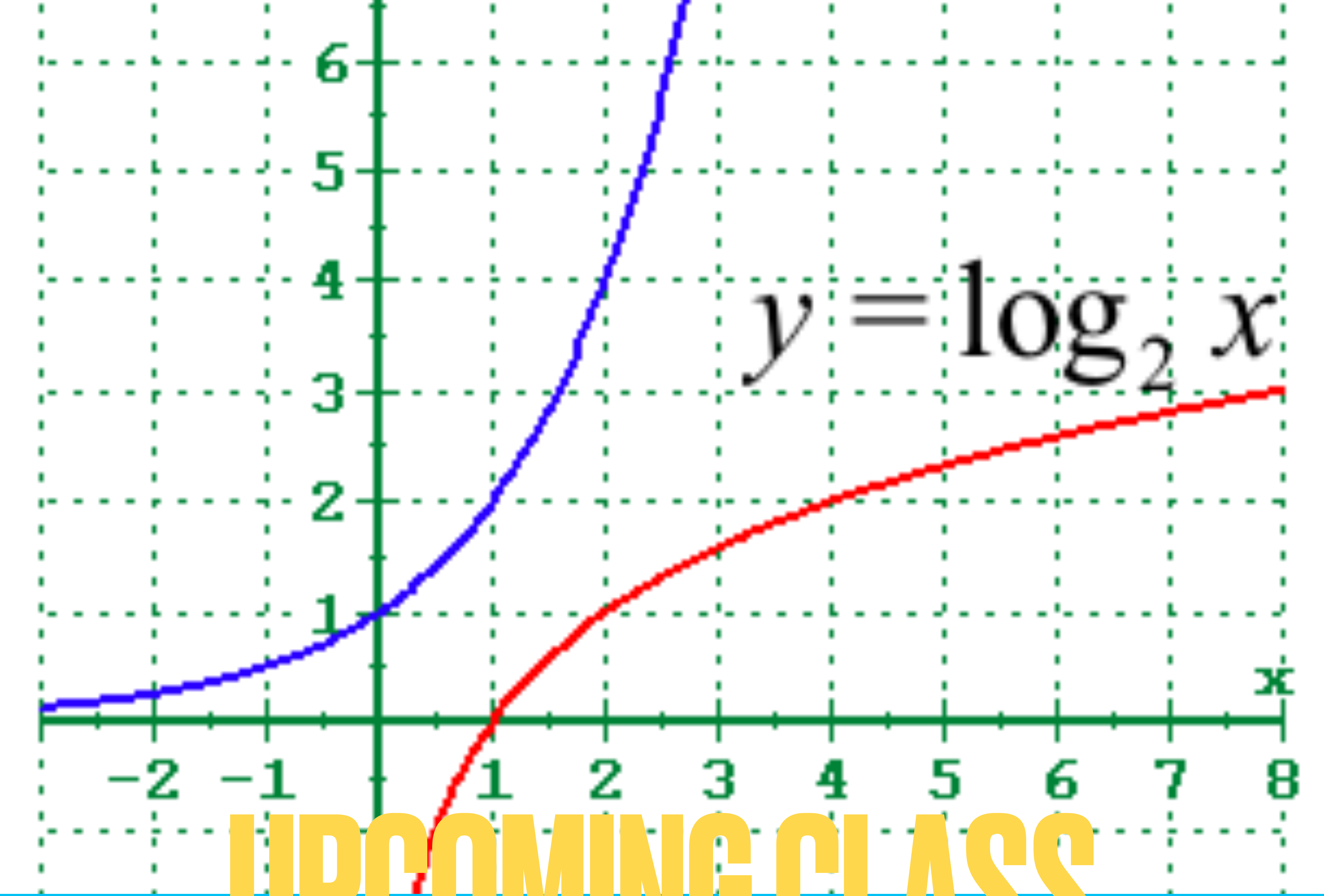
$log_a b^c = c \times log_a b$ $log_b x = y \rightarrow b^y = x$ $log_a b + log_a c = log_a b \times c$ $log_a b - log_a c = log_a b \div c$

Logarithmic functions, which are $y = log_b(x)$, are inverses of exponential functions, which are $y = ab^x$.

You can convert between exponential and logarithmic functions at any time.
If you're trying to solve for an exponent variable but the bases of the two constant does not match, you can use logarithms.

APPLICATIONS OF LOGARITHM

Earthquakes, pH levels, decibel levels, and volcanic eruptions are all examples of logarithms.



UPCOMING CLASS

How to graph a logarithmic graph?
How to transform a logarithmic graph?

Images

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