Week 9
MTH-1320 – PreCalculus

Hello and Welcome to the weekly resources for MTH-1320 – PreCalculus!

This week is Week 9 of class, and typically in this week of the semester. your professors are covering these topics below. If you do not see the topics your particular section of class is learning this week, please take a look at other weekly resources listed on our website for additional topics throughout of the semester.

We also invite you to **look at the group tutoring chart on our website to see if this course has a group tutoring session offered this semester**.

If you have any questions about these study guides, group tutoring sessions, private 30 minute tutoring appointments, the Baylor Tutoring YouTube channel or any tutoring services we offer, please visit our website www.baylor.edu/tutoring or call our drop in center during open business hours. M-Th 9am-8pm on class days 254-710-4135.

Key Words: Logarithmic functions

Topic of the Week: Log functions

The inverse of an exponential function is called a logarithmic function. So if f(x) is an exponential function of the form $f(x) = b^x$, its inverse has the form $f^{-1}(x) = \log_b(x)$.
A logarithmic function reverses an exponential function.

In fact,

$y = \log_b(x)$ and $x = b^y$ are equivalent under certain conditions

- x must be greater than 0
- b must be greater than 0 (this was also a requirement for exponential functions)
- b cannot be equal to 1 (also a requirement with exponential functions)

Since logs are the inverse of exponential functions, the domain of a log function is the range of its corresponding exponential, and its range it's the domain of the exponential. So

- Domain: (0, ∞)
- Range: (-∞, ∞)

Rationalizing logs can be confusing. An easy way I remember them and understand them is by asking myself this question: to what exponent do I have to raise b to get x?
Let's look at a log and let's see how this question relates to the statement

$\log_b x$ = y is the same as writing $b^y = x$

So if, we only have $\log_b x = y$, we are trying to find y, which is the exponent to which we raise b to in order to get x.

It is confusing at the beginning, so be patient with yourself.

There are two common logarithms that have their own special notation:

- Logarithms with base 10 are often written as $\log x$ (notice how there is no tiny b at the side of the log). Therefore, if you see a log with no space for b, you must assume that the log is base 10
- Logarithms with base e are written as ln(x).

Highlight #1: graphs of logarithmic functions

Finding the domain of a logarithm

If a logarithm does not simply have 'x' as an argument, there are more steps to finding the domain.

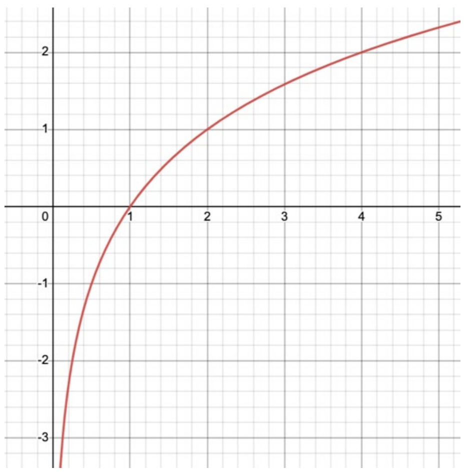
1) Set the expression inside the parentheses (argument) to being greater than 0
2) Solve the inequality for x

Graphing a Logarithmic Function

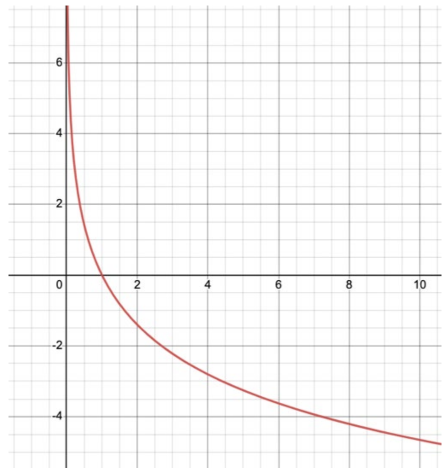
The parent logarithmic function is shown below

Note! There are:

- Vertical asymptote at x = 0
- An x-intercept at (1,0)
- A defined point at (b,1)



b > 1



0 < b < 1

Note! If the base is greater than 1, the graph increases, while if it is between 0 and 1, the graph decreases (which is in line with what we have seen with exponential functions, if the base of an exponential function is less than 1 the graph decreases)

The steps to graphing the parent logarithm are the following:

1) Draw and label the vertical asymptote at x = 0 (the y-axis)
2) Plot the x-intercept (1,0)
3) Plot the point (b,1) (where b is the base of the logarithm)
4) Draw a continuous curve through the points

Note! A logarithm with an horizontal shift such as f(x) = log(x-c), implies that the vertical asymptote is at x = c, and not at x = 0
A horizontal stretch/compression can also be applied

Things you might struggle with:

- Going from logarithm form to exponential form
- ln simply means "log with e as the base"
- logarithms in general can be tricky at the beginning, so be patient with yourself

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Check Your Learning

1. Rewrite $y = 2^x$ in logarithm form

2. Solve the equation log(x) = 3 by rewriting it in exponential form

3. Find the domain of the function f(x) = $\log_2(5x - 2) + 3$.

Thanks for checking out these weekly resources!
Don't forget to check out our website for group tutoring times, video tutorials and lots of other resources: www.baylor.edu/tutoring ! Answers to check your learning questions are below!

Answers to Check Your Learning

1.
Let's start by figuring out what the base of the algorithm is.

The question we always ask ourselves when dealing with logs is "to what exponent am I raising the base to, to get x?" and in this case the number we are raising to a power is 2, so 2 is the base of our log

$$\log_2(\ ) =$$

We also know that the solution to a log is an exponent, meaning on the other side of the equal sign there will be an exponent. If we look at the original exponential equation, the exponent we see is x. Therefore, the final answer is

$$\log_2(y) = x$$

2.

Once again, let's start by figuring out what the base of the log is, as that will also be the base of the exponential function.

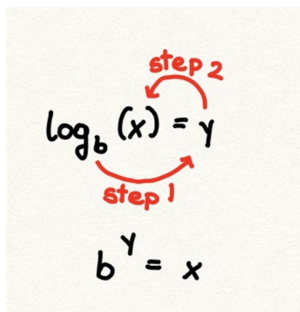
Since there is no small number next to the log, we know the base must be 10.

Let's convert the log into an exponential.

$$10^3 = x$$

So x = 1000.

Hint! It is fairly easy to go from exponent to go around the world! Look below, it is an easy way to remember it!



3.

We can only take the log of positive numbers, which means that everything inside the parenthesis must be greater than 0.

$$5x - 2 > 0$$
$$5x > 2$$
$$x > \frac{2}{5}$$