PC 3-0 **Chapter Preview and Homework**

I can convert exponential equations to logarithms and visa versa

Use the "circle of logs" to convert the logarithm into an exponential equation.		Convert the exponoential equation into a logarithm.	
Example: $log_3 x = 2$	Practice: $log_x 16 = 2$	Example: $3^x = 7$	Practice: $4^x = 56$

The **natural logarithm** is a log with a base of "*e*". *It looks like this:* $\ln x$

So, $\mathbf{\ln x = log_e x}$.

Also, if we write $\log x$ without a base, it is assumed that the base is 10. (You'll notice your calculator has this button). So, $\mathbf{\log x = log_{10} x}$

Rewrite in exponential form to help solve for x. NO CALCULATORS!!!

1. $log_2 8 = x$	2. $log_4 \left(\frac{1}{16}\right) = x$	3. $log_x 49 = 2$	4. $log_{10} x = 2$

I can find the domain of a logarithmic function

Find the domain of the logarithm.

$$y = \ln{(x - 3)}$$

Find the domain of the logarithm.

$$y = log\left(\frac{1}{x + 1}\right)$$

5. Find the domain of the logarithm.

$$y = log_3(x + 7)$$

6. Find the domain of the logarithm.

$$y = ln\left(\frac{3}{4x + 5}\right)$$

I can re-write and solve logarithmic equations

Solve the equation.

$$log_5 x = 3$$

Solve the equation. (Hint: Re-Base Method)

$$log_3 81 = 2x - 8$$

7. Solve the following equations for x.

$log_2(2x+1)=3$	$log_3(3x-2)=2$	$log_x 4=2$	$log_6 36=5x+3$

Extraneous Solutions appear when solving logarithms when a solution is not part of the domain.

Example: Solve for x. $log_6 x + log_6(x-5)=1$

8. $log_3(x^2+1)=2$

9. $log_{10}x + log_{10}(x+15)=2$
(Hint: Use properties of logarithms)

If $M=N$**, then** $log_a M = log_a N$

If $log_a M = log_a N$ **, then** $M=N$

Change of Base Formula
If $a \neq 1$, $b \neq 1$, and M are positive real numbers, then

$$log_a M = \frac{log_b M}{log_b a}$$

10. Solve for x.

$$\log 3 = \log x$$

11. Solve for x.

$$\ln 3x = \log 9$$

12. Solve for x.

$$\log 2x + 3 = \log 9$$

13. Use the change of base formula and then evaluate with a calculator.

$log_5 12$

14. Use the change of base formula and then evaluate with a calculator.

$log_2 9$

15. Use the change of base formula and then evaluate with a calculator.

$log_6 8$

PC 3-0 **Definition of Logarithm/Definition of *e***

The **logarithm to the base a**, where $a > 0, and\ a \neq 1$ is written as $y = log_a x$.
"y equals the logarithm base a of x"

$y = log_a x$ *if and only if* $x = a^y$

The domain of the logarithm $y = log_a x$ is $x > 0$.

The **number *e*** is defined as:

$\left(1+\frac{1}{n}\right)^n$ as the number n goes to infinity (∞)

In Calculus, using limit notation:

$$e = \lim_{n\to\infty}\left(1+\frac{1}{n}\right)^n$$

Properties of Logs:

The log of a Product Equals the Sum of the Logs

$$log_a(MN) = log_a M + log_a N$$

Example: $log_3(4x) =$

The log of a Quotient Equals the Difference of the Logs

$$log_a\left(\frac{M}{N}\right) = log_a M - log_a N$$

Example: $log_3\left(\frac{4}{x}\right) =$

The log of a Power Equals the Product of the Power and the log

$$log_a M^r = r log_a M$$

Example: $log_6 10^8 =$

Fill in the table below to calculate e.

n	$\frac{1}{n}$	$1+\frac{1}{n}$	$\left(1+\frac{1}{n}\right)^n$
1			
2			
5			
10			
100			
1,000			
10,000			

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