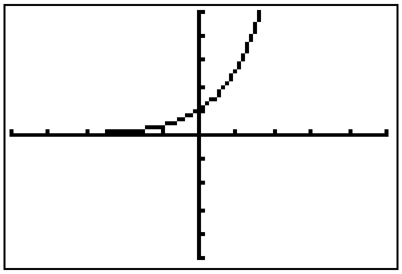
Unit 7:Exponential & Logarithmic Functions Name _______________Date______

The Natural Exponential Function: $f(x) = e^x$, where e is the constant 2.718281828... and x is the variable.



X	Y_1
-3	.04979
-2	.13534
-1	.36788
0	1
1	2.7183
2	7.3891
3	20.086

X= -3

I. Evaluating the Natural Exponential Function:

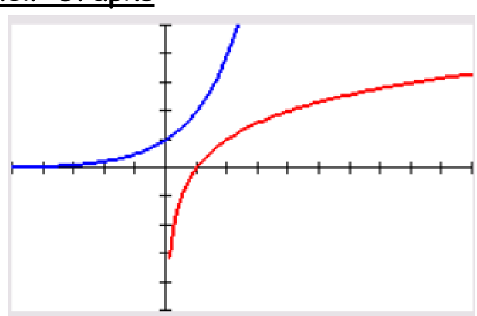
Use a calculator to evaluate the function.

1. $f(x) = e^{6.2}$ 2. $f(x)=e^{-0.4}$ 3. $f(x)=e^{-7.1}$

II. One To One Property: With e

1. 2. 3. 4.

Logarithmic Functions & Their Graphs



(a.) Is the equation $y=2^x$ a function? ______Why or Why not? ______________

(b.) Does the equation $y=2^x$ have an inverse? _____ Why or Why not? _______________

(c.) What is it's inverse? _________________________

I. Logarithmic Function with Base *a*:

The inverse function of every function in the form $f(x)=a^x$ is the logarithmic function with base a.

Logarithmic Function	Exponential Form
$\log_a x = y$	$a^y = x$
$2=\log_3 9$	
	$16=4^2$
$3=\log_2 8$	
	$125=5^3$

Examples:

1.

2.

3.

4.

Evaluate the following logarithms.

1. $f(x)=\log_2 32$

2. $f(x)=\log_3 1$

3. $f(x)=\log_4 2$

II. Common Logarithmic Function has a base of 10.

We write __________or ____________.

Evaluate with a Calculator.

1. $\log 10$

2. $\log\left(\frac{1}{3}\right)$

3. $\log 2.5$

III. Properties of Logarithms (log)

1. $\log_a 1 = 0$ because $a^0 = 1$
2. $\log_a a = 1$ because $a^1 = a$
3. $\log_a a^x = x$ because $a^{\log_a x} = x$
4. If $\log_a x = \log_a y$, then $x = y$

Examples:

1. $\log_4 1 = x$

2. $\log_{\sqrt{11}} \sqrt{11} = x$

3. $5^{\log_5 10} = x$

4. $\log_5 y = \log_5 16$

5. $\log(4-3x)=\log(x+2)$

6. $\log_3(x^2+4)=\log_3 29$

VI. The Natural Logarithmic Function (ln) $f(x) = \log_e x = \ln x, x > 0$

Properties of Natural Logarithms

1. $\ln 1 = 0$ because $e^0 = 1$
2. $\ln e = 1$ because $e^1 = e$
3. $\ln e^x = x$ and $e^{\ln x} = x$
4. *If* $\ln x = \ln y$, then $x = y$

Examples: Simplify each expression.

1. $\ln \frac{1}{e}$ =

2. $e^{\ln 5}$ =

3. $\frac{\ln 1}{3}$ =

4. $2 \ln e$ =

V. What about $\log_4 25 = x$???

Change-of-Base Formula: $\log_a x = \frac{\log x}{\log a}$

1) $\log_4 25 = x$

2) $\log_2 12 = x$

3) $\ln_7 5 = x$

PRACTICE:

1. $4^x = 324$
2. $5^{2x-3} = 100$
3. $e^x = 22$
4. $4(3)^x = 438$
5. $e^{x+5} = 41$
6. $10^{3x} = 5793$
7. $8^x = 10$
8. $1.8^{x-5} = 19.8$
9. $x = \log_3 12.3$
10. $1249 = 175e^{-0.04t}$
11. $\ln 6.7 = \ln e^{0.21t}$
12. $4^{1-2x} = 3$