Key

Unit 4 Study Guide

Convert the equation to logarithmic form: $42 = x^3$

$\log_x 42 = 3$

Convert the equation into exponential form: $log_{64}16 = \frac{2}{3}$

$64^{2/3} = 16$ or $\sqrt[3]{64^2}$

Evaluate:

$log_{64}8$ $.5$	$log_{16}\frac{1}{2}$ $-.25$	$log_{17}17$ 1	$log_4 - 8$ $\emptyset$
$log_3\frac{1}{81}$ -4	$9^{log_9 81}$ 81	$log_5 27$ 2.05	e^{ln6} 6
$ln \cdot e^{32}$ 32	$\frac{ln \cdot e^6}{18}$ $.33$	$3.5e^4$ 191.09	e^5 148.41

Condense:

$log_3 x + log_3 x$ $\log_3 x^2$	$2log_4 x + log_4(x+2)$ $\log_4(x^3+2x^2)$	$log_5(x+1) + log_3(x+2)$ $\cancel{\log_5(x^2+3x+2)}$ different bases-can't condense
$\log(x^2-4) - \log(x+2)$ $\log\left(\frac{x^2-4}{x+2}\right) = \log\frac{\cancel{(x+2)}(x-2)}{\cancel{(x+2)}}$ $\log(x-2)$	$\ln 4x + 3\ln x$ $\ln(4x^4)$	$3\ln x - 2\ln x$ $\ln\frac{x^3}{x^2} = \ln x$

Expand:

$log_2 5x^2$ $\log_2 5 + 2\log_2 x$	$log\frac{5x}{y}$ $\log 5 + \log x - \log y$	$log\sqrt{\frac{m}{n}}$ $\log\left(\frac{m}{n}\right)^{1/2} = \frac{1}{2}(\log m - \log n)$
$log 2x^3 y$ $\log 2 + 3\log x + \log y$	$ln x^3 y^2$ $3\ln x + 2\ln y$	$ln\sqrt[3]{mn}$ $\ln(mn)^{1/3}$ $\frac{1}{3}(\ln m + \ln n)$

Solve the following Exponential Equations:

$4^3 = 2^x$ $2^{2 \cdot 3} = 2^x$ $x = 6$	$3^{5x-6} = 81$ $3^{5x-6} = 3^4$ $5x - 6 = 4$ $x = 2$	$3^{x-11} = 7$ $\underbrace{\log_3 7}_{\text{calc}} = x - 11$ $x = 12.77$

$(2x-3)(x+4)$

$x=\frac{3}{2}, \cancel{-4}$

Solve the following Logarithmic Equations:

$log_3(4x-3)=4$ $3^4=4x-3$ $x=21$	$\cancel{log}(2x+6)=\cancel{log}(2x^2+7x-6)$ $0=2x^2+5x-12$ $(2x^2+8x)(-3x-12)$ $2x(x+4)-3(x+4)$	$logx-log9=log18$ $\cancel{log}\ \frac{x}{9}=\cancel{log}\ 18$ $\frac{x}{9}=18$ $x=162$
$\log(x+3)+\log(x+4)=\log x+\log(x+8)$ $\cancel{x^2}+7x+12=\cancel{x^2}+8x$ $12=x$		$\log(3x+7)=3$ $10^3=3x+7$ $x=331$

Solve the following Equations:

$4e^x-3=6$ $e^x=\frac{9}{4}$ $\log_e\frac{9}{4}=x\to x=.81$	$e^3\cdot e^x=15$ $e^{3+x}=15$ $\log_e 15=3+x$ $x=-.29$
$\ln(3x+4)=9$ $e^9=3x+4$ $x=2{,}699.69$	$ln4x+ln2x=8$ $\ln 8x^2=8$ $e^8=8x^2$ $\cancel{x=\pm 19.3}$ $x=\cancel{-19.3}, 19.3$

Exponential Growth/Decay

1.) Determine if the following functions are grow or decay.
2.) Determine the growth or decay factor as a **percent**.

$f(x)=6(1.04)^x$ growth, 4%.	$f(x)=11(.86)^x$ decay, 14%.

In 2010, there was a population 2165 mice and they are decreasing at a rate of 17% per year.

a. Write an exponential function for this model. $y=2165(1-.17)^t$

b. Predict how many mice there will be this year. $y=2165(1-.17)^8=487.6$

c. When will there be 1200 mice?

$1200=2165(1-.17)^t \to .55427=.83^t$

$\log_{.83}.55427=t$

$t=3.17$

Iron-59 is used in medicine to diagnose blood circulation disorders. The half-life of iron-59 is 44.5 days.

a. Write an exponential function that models the decay of this substance?
b. How much of a 2.0 mg sample will remain after 133.5 days?
c. How long will it take to have a 2.5 mg of iron-59 left over?

a.

You saved $2500 from your summer job. Which option yields more money? What is the positive difference between the 2 options? $ 20

option 1

*Option 1: *	Option 2:
A traditional savings account at 3.5% interest compounded monthly for 5 years. $y = 2500\left(1 + \frac{.035}{12}\right)^{(12)(5)} =$	A savings account with 4.2% interest compounded continuously for 4 years. $y = 2500\, e^{(.042)(4)} =$

Better option $ 2,977.36

y = $ 2957.34

Find the inverse of the following function:

$f(x) = log_5(x-2)+4$

$x = \log_5(y-2)+4$

$\log_5(y-2) = x-4$

$5^{x-4} = y-2$

$f^{-1}(x) = 5^{x-4}+2$

Find the inverse of the following function:

$f(x) = 3^{x+3}-5$

$y = 3^{x+3}-5$

$x = 3^{y+3}-5$

$x+5 = 3^{y+3}$

$\log_3(x+5) = y+3$

$f^{-1}(x) = \log_3(x+5)-3$

Graph:

$f(x) = log_5(x-2)+4$

Identify:

Parent Function: $y = \log x$

Evaluate: $f(7) =$ $\log_5(5)+4$ $1+4 = 5$

Transformation: right 2, up 4

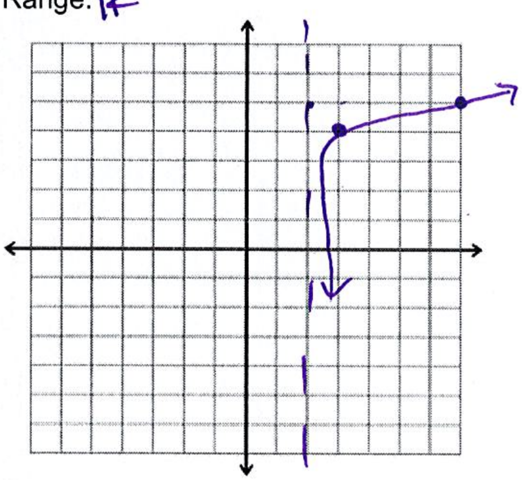
Key Point: $(1,0) \rightarrow (3,4)$

Additional Point: $(5,1) \rightarrow (7,5)$

Equation of Asymptote: $x = 2$

Domain: $(2, \infty)$

Range: $\mathbb{R}$



$f(x) = 3^{x+3}-5$

Identify:

Parent Function: $y = 10^x$

Evaluate: $f(3) =$ $3^{3+3}-5$ 3^6-5 724

Transformation: left 3, down 5

Key Point: $(0,1) \rightarrow (-3,-4)$

Additional Point: $(1,3) \rightarrow (-2,-2)$

Equation of Asymptote: $y = -5$

Domain: $\mathbb{R}$

Range: $(-5, \infty)$