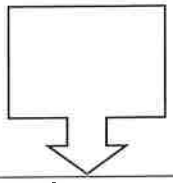
Name _____ 3

Honors Math III – Unit 3 – Logs and Exponentials



Date	Lesson/Objective	Homework
Friday Sept. 29	***Properties of Exponents*** ***Solving exponential equations with like bases*** Early Release	3-1
Monday Oct. 2	***Exponential Growth and Exp. Decay Applications***	3-2
Tues. Oct. 3	***Introduction to Logs*** ***Solve log Equations***	3-3
Wed. Oct. 4	***Properties of Logs***	3-4
Thurs. Oct. 5	***Solve Logarithmic and Exp. Equations*** ***Quiz Days 1-3***	3-5
Fri. Oct. 6	***Natural Logarithms***	3-6
Mon. Oct. 9	**Application Problems**	3-7
Tues. Oct. 10	**Graph Exp and Log Functions**	3-8
Wed. Oct. 11	**REVIEW** **PSAT**	Complete Review WS
Thurs. Oct. 12	***Review***	Study!!
Friday Oct. 13	***TEST – Unit 3***	

3-1

ALGEBRA 2 WORKSHEET SOLVING EXPONENTIAL EQUATIONS

Solve each equation for x.

1) $2^x = 2^{3x-4}$ 2) $3^{2x-1} = 3$ 3) $25^{x+3} = 25^{5x-7}$ 4) $4^{3x-5} = 4^{8-x}$

5) $5^{x+1} = 25$ 6) $3^{x-5} = 27$ 7) $2^{3x-4} = 8^{x-1}$ 8) $3^{2x-4} = 1$

9) $4^{x+2} = 8$ 10) $9^x = 27$ 11) $\left(\frac{1}{3}\right)^{x+2} = 9^{3x}$ 12) $\left(\frac{1}{4}\right)^{x-1} = 32^{x+3}$

13) $18^{4x} = 18^x$ 14) $125^{3-2x} = 5^{x-1}$ 15) $4^{x-1} = \frac{1}{64}$ 16) $\left(\frac{1}{4}\right)^x = 8^{x-1}$

17) $3^x = 3\sqrt{3}$ 18) $5^x = 25\sqrt{5}$ 19) $4^{2x} = 16\sqrt[3]{4}$ 20) $3^{x-4} = 9\sqrt{3}$

ALGEBRA 2 WORKSHEET SOLVING EXPONENTIAL EQUATIONS

Solve each equation for x.

1) $2^x = 2^{3x-4}$ 2) $3^{2x-1} = 3$ 3) $25^{x+3} = 25^{5x-7}$ 4) $4^{3x-5} = 4^{8-x}$

5) $5^{x+1} = 25$ 6) $3^{x-5} = 27$ 7) $2^{3x-4} = 8^{x-1}$ 8) $3^{2x-4} = 1$

9) $4^{x+2} = 8$ 10) $9^x = 27$ 11) $\left(\frac{1}{3}\right)^{x+2} = 9^{3x}$ 12) $\left(\frac{1}{4}\right)^{x-1} = 32^{x+3}$

13) $18^{4x} = 18^x$ 14) $125^{3-2x} = 5^{x-1}$ 15) $4^{x-1} = \frac{1}{64}$ 16) $\left(\frac{1}{4}\right)^x = 8^{x-1}$

17) $3^x = 3\sqrt{3}$ 18) $5^x = 25\sqrt{5}$ 19) $4^{2x} = 16\sqrt[3]{4}$ 20) $3^{x-4} = 9\sqrt{3}$

ALGEBRA 2 WORKSHEET SOLVING EXPONENTIAL EQUATIONS

Solve each equation for x.

1) $2^x = 2^{3x-4}$ 2) $3^{2x-1} = 3$ 3) $25^{x+3} = 25^{5x-7}$ 4) $4^{3x-5} = 4^{8-x}$

5) $5^{x+1} = 25$ 6) $3^{x-5} = 27$ 7) $2^{3x-4} = 8^{x-1}$ 8) $3^{2x-4} = 1$

9) $4^{x+2} = 8$ 10) $9^x = 27$ 11) $\left(\frac{1}{3}\right)^{x+2} = 9^{3x}$ 12) $\left(\frac{1}{4}\right)^{x-1} = 32^{x+3}$

13) $18^{4x} = 18^x$ 14) $125^{3-2x} = 5^{x-1}$ 15) $4^{x-1} = \frac{1}{64}$ 16) $\left(\frac{1}{4}\right)^x = 8^{x-1}$

17) $3^x = 3\sqrt{3}$ 18) $5^x = 25\sqrt{5}$ 19) $4^{2x} = 16\sqrt[3]{4}$ 20) $3^{x-4} = 9\sqrt{3}$

3-2

Honors Math 3: HW Exponential Practice Day 2 (applications)

For each of the following, give the initial value, determine if growth/decay, give the growth/decay factor, and then give the % increase or decrease (be sure to say "increase" or "decrease").

1. $f(x)=6\left(\frac{1}{3}\right)^x$
2. $f(x)=2(4)^x$
3. $f(x)=\left(\frac{2}{3}\right)^x$
4. $f(x)=4\left(\frac{6}{5}\right)^x$

5. $f(x)=3\left(\frac{1}{4}\right)^{-x}$
6. $f(x)=7\left(\frac{5}{2}\right)^{-x}$
7. $f(x)=2(0.15)^x$

You have purchased a new car for $16000. You expect the value of the car to decrease by 15% each year.

8. Write an exponential decay model for the value, V, of the car after t years.

9. What will the car be worth after five years?

A house was purchased for $190,000 in 1995. You expect the value of the home to increase by 5% each year.

10. Write an exponential growth model for the, V, of the house after t years.

11. What will the house be worth in 2020?

The amount g (in trillions of cubic feet) of natural gas consumed in the US from 1940 to 1970 can be modeled by $g=2.91(1.07)^t$ where t is the number of years since 1940.

12. Identify the initial amount, the growth factor, and the annual percent increase.

13. How much natural gas was consumed in 1956?

The number A (in millions) of record albums sold each year in the US from 1982 to 1993 can be modeled by $A=265(0.39)^t$ where t represents the number of years since 1982.

14. Identify the initial amount, the decay factor, and the annual percent decrease.

15. How many albums were sold in 1990?

Homework 6.1: Intro to Logarithms

Math 3
3-3
2 pgs

Directions: Answer questions #1-16 on the front, and questions #1-11 odd on the back.

I. **Write each equation in logarithmic form.**

1. $9^2 = 81$
2. $\frac{1}{64} = \left(\frac{1}{4}\right)^3$
3. $8^3 = 512$
4. $\left(\frac{1}{3}\right)^{-2} = 9$

1-16

II 2-12 even

5. $2^9 = 512$
6. $4^5 = 1024$
7. $5^4 = 625$
8. $10^{23} = 0.001$

Evaluate each logarithm.

9. $\log_2 128$
10. $\log_4 32$
11. $\log_9 (27)$
12. $\log_2 (-32)$

13. $\log_{\frac{1}{3}} \frac{1}{9}$
14. $\log 100{,}000$
15. $\log_7 7^6$
16. $\log_3 \frac{1}{81}$

(over)

Kuta Software - Infinite Algebra 2

Name_____

Logarithmic Equations

Date_____ Period____

Solve each equation.

1) $\log 5x = \log (2x + 9)$

2) $\log (10 - 4x) = \log (10 - 3x)$

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

4) $\log (4k - 5) = \log (2k - 1)$

5) $\log (-2a + 9) = \log (7 - 4a)$

6) $2\log_7 -2r = 0$

7) $-10 + \log_3 (n + 3) = -10$

8) $-2\log_5 7x = 2$

9) $\log -m + 2 = 4$

10) $-6\log_3 (x - 3) = -24$

11) $\log_{12} (v^2 + 35) = \log_{12} (-12v - 1)$

12) $\log_9 (-11x + 2) = \log_9 (x^2 + 30)$

Homework 2.4/2.5: Solving Logarithms

3.4 1-20

Unit 2

3.5 21-38

Math 3

Directions: 3.4 *Hwk Assg problems 1-20. Show all work on a separate sheet of paper!*
3.5 *Hwk Assg problems 21-38. show all work on a separate sheet of paper!*

3.4

In exercises 1 to 20, solve each logarithmic equation for x.

1. $\log_4 x = 3$
2. $\log_3 x = -2$
3. $\log (x + 1) = 2$
4. $\log_5 (2x - 1) = 2$
5. $\log_2 x + \log_2 8 = 6$
6. $\log 5 + \log x = 2$
7. $\log_3 x - \log_3 6 = 3$
8. $\log_4 x - \log_4 8 = 3$
9. $\log_2 x + \log_2 (x + 2) = 3$
10. $\log_3 x + \log_3 (2x + 3) = 2$
11. $\log_7 (x + 1) + \log_7 (x - 5) = 1$
12. $\log_2 (x + 2) + \log_2 (x - 5) = 3$
13. $\log x - \log (x - 2) = 1$
14. $\log_5 (x + 5) - \log_5 x = 2$
15. $\log_3 (x + 1) - \log_3 (x - 2) = 2$
16. $\log (x + 2) - \log (2x - 1) = 1$
17. $\log (x + 5) - \log (x - 2) = \log 5$
18. $\log_3 (x + 12) - \log_3 (x - 3) = \log_3 6$
19. $\log_2 (x^2 - 1) - \log_2 (x - 2) = 3$
20. $\log (x^2 + 1) - \log (x - 2) = 1$

3.5

In exercises 21 to 38, solve each exponential equation for x. Give your solutions in decimal form, correct to three decimal places.

21. $5^x = 625$
22. $4^x = 64$
23. $2^{x+1} = \frac{1}{8}$
24. $9^x = 3$
25. $8^x = 2$
26. $3^{2x-1} = 27$
27. $3^x = 7$
28. $5^x = 30$
29. $4^{x+1} = 12$
30. $3^{2x} = 5$
31. $7^{3x} = 50$
32. $6^{x-3} = 21$
33. $5^{3x-1} = 15$
34. $8^{2x+1} = 20$
35. $4^x = 3^{x+1}$
36. $5^x = 2^{x+2}$
37. $2^{x+1} = 3^{x-1}$
38. $3^{2x+1} = 5^{x+1}$

ANSWERS

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____ 8. _____
9. _____ 10. _____
11. _____ 12. _____
13. _____ 14. _____
15. _____ 16. _____
17. _____ 18. _____
19. _____ 20. _____
21. _____ 22. _____
23. _____ 24. _____
25. _____ 26. _____
27. _____ 28. _____
29. _____ 30. _____
31. _____ 32. _____
33. _____ 34. _____
35. _____ 36. _____
37. _____ 38. _____

HW 3-6 # 1-42 multiples of 3, 53-56

Name _____ Class _____ Date _____

7-6 Practice (Form G)

Natural Logarithms

Write each expression as a single natural logarithm.

1. $\ln 16 - \ln 8$
2. $3\ln 3 + \ln 9$
3. $a\ln 4 - \ln b$
4. $\ln z - 3\ln x$
5. $\frac{1}{2}\ln 9 + \ln 3x$
6. $4\ln x + 3\ln y$
7. $\frac{1}{3}\ln 8 + \ln x$
8. $3\ln a - b\ln 2$
9. $2\ln 4 - \ln 8$

Solve each equation. Check your answers. Round your answer to the nearest hundredth.

10. $4\ln x = -2$
11. $2\ln(3x - 4) = 7$
12. $5\ln(4x - 6) = -6$
13. $-7 + \ln 2x = 4$
14. $3 - 4\ln(8x + 1) = 12$
15. $\ln x + \ln 3x = 14$
16. $2\ln x + \ln x^2 = 3$
17. $\ln x + \ln 4 = 2$
18. $\ln x - \ln 5 = -1$
19. $\ln e^x = 3$
20. $3\ln e^{2x} = 12$
21. $\ln e^{x+5} = 17$
22. $\ln 3x + \ln 2x = 3$
23. $5\ln(3x - 2) = 15$
24. $7\ln(2x + 5) = 8$
25. $\ln(3x + 4) = 5$
26. $\ln\frac{2x}{41} = 2$
27. $\ln(2x - 1)^2 = 4$

Use natural logarithms to solve each equation. Round your answer to the nearest hundredth.

28. $e^x = 15$
29. $4e^x = 10$
30. $e^{x+2} = 50$
31. $4e^{3x-1} = 5$
32. $e^{x-4} = 2$
33. $5e^{6x+3} = 0.1$
34. $e^x = 1$
35. $e^{\frac{x}{5}} = 32$
36. $3e^{3x-5} = 49$
37. $7e^{5x+8} = 0.23$
38. $6 - e^{12x} = 5.2$
39. $e^{\frac{x}{2}} = 25$
40. $e^{2x} = 25$
41. $e^{\ln 5x} = 20$
42. $e^{\ln x} = 21$
43. $e^{x+6} + 5 = 1$

Name _____ Class _____ Date _____

7-6 Practice (continued)

Natural Logarithms

The formula $P = 50e^{-\frac{t}{23}}$ gives the power output P, in watts, needed to run a certain satellite for t days. Find how long a satellite with the given power output will operate.

44. 10 W
45. 12 W
46. 14 W

The formula for the maximum velocity v of a rocket is $v = -0.0098t + c\ln R$, where c is the exhaust velocity in km/s, t is the firing time, and R is the mass ratio of the rocket. A rocket must reach 7.7 km/s to attain a stable orbit 300 km above Earth.

47. What is the maximum velocity of a rocket with a mass ratio of 18, an exhaust velocity of 2.2 km/s, and a firing time of 25 s?

48. Can the rocket in Exercise 47 achieve a stable orbit? Explain your answer.

49. What mass ratio would be needed to achieve a stable orbit for a rocket with an exhaust velocity of 2.5 km/s and a firing time of 29 s?

50. A rocket with an exhaust velocity of 2.4 km/s and a 28 second firing time can reach a maximum velocity of 7.8 km/s. What is the mass ratio of the rocket?

By measuring the amount of carbon-14 in an object, a paleontologist can determine its approximate age. The amount of carbon-14 in an object is given by $y = ae^{-0.00012t}$, where a is the amount of carbon-14 originally in the object, and t is the age of the object in years.

51. A fossil of a bone contains 32% of its original carbon-14. What is the approximate age of the bone?

52. A fossil of a bone contains 83% of its original carbon-14. What is the approximate age of the bone?

Simplify each expression.

53. $\ln e^4$
54. $5\ln e^5$
55. $\frac{\ln e^2}{2}$
56. $\ln e^{100}$

HW 3-7

Application

Compound Interest Formula

A = total amount (interest + principal), in dollars
P = principal invested, in dollars
r = rate of annual interest, expressed as a decimal
n = number of times a year interest is compounded
t = number of years principal is invested

$$A = P\left(1+\frac{r}{n}\right)^{nt}$$

1. Rita puts \$3000 in a bank account at 8% annual interest, compounded semiannually. How long will it take the account to earn \$1800 interest?

2. Bill invested \$10,000 at 6.75% annual interest, compounded quarterly. How long will it take the investment to double in value?

3. At 6% annual interest, compounded monthly, how long will it take for a \$100 investment to be worth \$300?

Continuously Compounded Interest Formula

A = total amount (interest + principal), in dollars
P = principal invested, in dollars
r = rate of annual interest, expressed as a decimal
t = number of years principal is invested

$$A = Pe^{rt}$$

4. You deposit \$1200 in an account that pays 5% interest. After 10 years, you withdraw all the money. Find the balance in the account if the interest was compounded continuously.

5. You deposit \$2000 in an account that pays 6% interest, compounded continuously. How long will it take for the balance to reach \$2500?

6. You deposit \$5000 in an account that pays 4.5% interest, compounded continuously. How long will it take for the balance to reach \$7500?

Other Application Problems

7. The battery power available to run a satellite is given by the formula $P = 50e^{\frac{-t}{250}}$, where P is power in watts and t is time in days. How long can the satellite run if it requires 15 watts? 45 watts?

8. The equation $y = 281(1.0124)^x$ models the U.S. population y in millions of people, x years after the year 2000. When will the U.S. population reach 350 million?

9. Male American elks grow antlers with a spread of about 5 feet. The antler spread, a (in inches), and shoulder height, h (in inches), of an adult male elk are related approximately by the model $h = 116\log_{10}(a+40) - 176$. Approximate the shoulder height of a male American elk.

10. Suppose that you purchased a new car for \$20,000 in 1990. If the value of the car decreases by 16% each year, what will the car be worth in 1996? Let $t = 0$ represent 1990. When will the car be worth only \$2000?

11. The first permanent colony in America was established in Jamestown, Virginia in 1607. For 1610 through 1780, the population, P (in thousands), in colonial America can be modeled by $P = 242.4e^{0.00008t^2} - 244$, where $t = 10$ represents 1610. When was the population about 345 thousand?

12. The population of peninsular bighorn sheep in Mexico was approximately 6200 in 1971. By 1999, about 2300 remained. If the decay rate remains constant, in what year might only 200 peninsular bighorn sheep remain in Mexico?

HW 3-8

2 sides

Homework 2.7: Graphing Logs and Exponentials

Unit 2

Math 3

Analyze and graph the following exponential and logarithmic graphs. Your analysis of each function must include:

- Domain
- Range
- Horizontal Asymptotes
- Vertical Asymptotes
- End Behaviors
- Transformations

Graph each exponential functions.

1. $y = 2^{x+3} - 1$

Transformations:

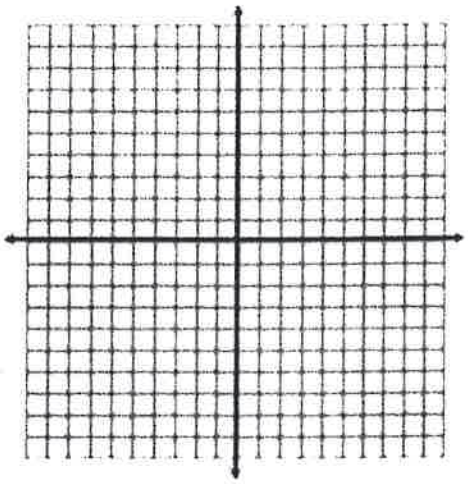
Domain:

Range:

Horizontal Asymptote:

End Behavior:

x	y



2. $y = 3\left(\frac{4}{3}\right)^{x-2} + 1$

Transformations:

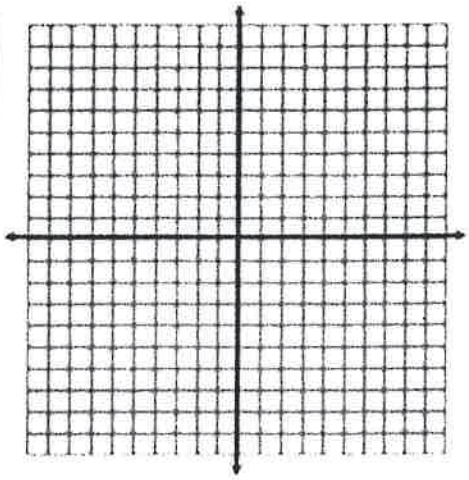
Domain:

Range:

Horizontal Asymptote:

End Behavior:

x	y



3. $y = \frac{1}{2}(2)^{x-1} - 4$

Transformations:

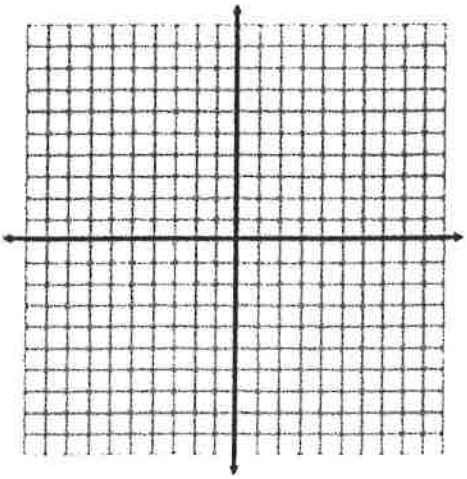
Domain:

Range:

Horizontal Asymptote:

End Behavior:

x	y



(over)

Find the inverse of the following.

9. $y = 3x - 12$

10. $y = \log_4(x-1)$

11. $y = \log_2(x) - 7$

12. $y = \log_4(x + 6) + 3$

Log Functions

13. $y = \log_2(x+1)+2$

Transformations:

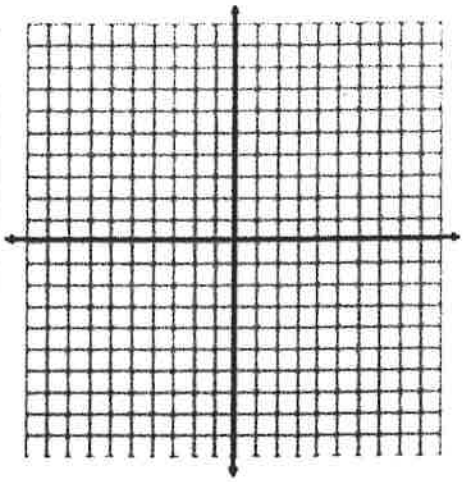
Domain:

Range:

Vertical Asymptote:

End Behavior:

x	y



14. $y = \log_2(x+3)-2$

Transformations:

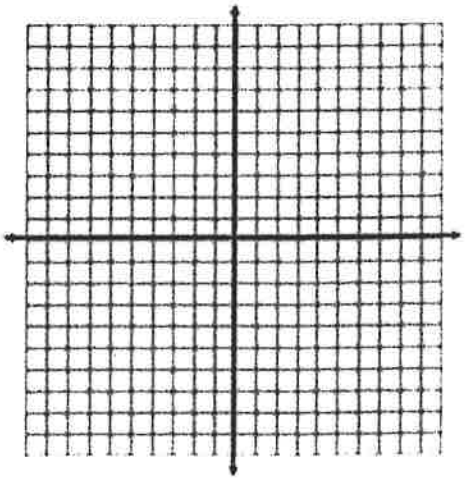
Domain:

Range:

Vertical Asymptote:

End Behavior:

x	y



15. $y = -1+\log_3(x+2)$

Transformations:

Domain:

Range:

Vertical Asymptote:

End Behavior:

x	y