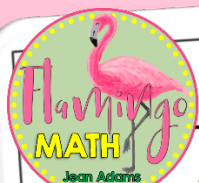


Algebra 2 Honors

Exponential and Logarithmic Equations



Modeling with an Exponential Equation

Ex. #4: The world's population can be modeled by the equation $P = 6.72(1.014)^x$
Let P = population in billions of people, x years after the year 2000.
Use the model to find: $x = 0$ at 2000 $x = 13$ @ 2013

A. The population in 2013.

$$P(13) = 6.72(1.014)^{13}$$

$$P(13) \approx 8.051238429$$

8,051,238,429 people
on about 8.05
billion in 2013

B. The year when the world population is about 9 billion people.

$$9 = 6.72(1.014)^x$$

$$\frac{9}{6.72} = 1.014^x$$

$$\log(1.339286) \approx x \log(1.014)$$

$$x = \frac{\log(1.339286)}{\log(1.014)} \approx \underline{\underline{21.012}}$$

Completely Editable

7.5

Lesson 7.5: Exponential and Logarithmic Equations

Exponential equation

An equation in the form $y = b^{ax}$, where the exponent includes a variable.

EX. $5^{2x} = 37$

WRITE THE STEPS TO SOLVE

$\log 5^{2x} = \log 37$ 1.

$(2x)\log 5 = \log 37$ 2.

$2x = \frac{\log 37}{\log 5}$ 3.

$2x \approx 2.243589$ 4.

$x \approx 1.12179$ 5.

Logarithmic equation

An equation that includes a logarithm involving a variable.

EX. $\log_3 x = 5$

WRITE THE STEPS TO SOLVE

$3^5 = x$ 1.

$x = 243$ 2.

Solving an Exponential Equation with a Common Base

EX #1: Solve.

A. $5^x = 125$

B. $27^{3x} = 81$

C. $4^{2x+1} = 1024$

Solving an Exponential Equation with a Different Base

EX #2: Solve each equation. Show your work.

A. $3^x = 17$

C. $8^{x-3} = 26$

B. $5^{2x} = 135$

Solving with a Graph or Table

EX. #3: Solve $2^{3x} = 9$

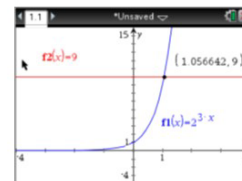
SOLVE BY GRAPHING:

1. Graph equations $Y_1 = 2^{3x}$ and $Y_2 = 9$

2. Adjust window settings

Xmin = -4; Xmax = 4; Ymin = -4; Ymax = 15

3. Find intersection.

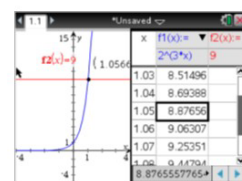


SOLVE BY TABLE:

Adjust TABLE SETUP

1. Table Start = 1

2. $\Delta Tbl = 0.01$



Modeling with an Exponential Equation

EX. #4: The world's population can be modeled by the equation $P = 6.72(1.014)^x$

Let P = population in billions of people, x years after the year 2000.

Use the model to find:

A. The population in 2013.

B. The year when the world population is about 9 billion people.

Solving a Logarithmic Equation

EX #5: Solve. Show all work.

A. $\log(2x+1) = \frac{1}{2}$

B. $-\log(3-2x) = -1$

Using Logarithmic Properties to Solve an Equation

EX #6: Solve. $\log(x+9) + \log x = 1$

EX #7: Solve. $\log 6 - \log 3x = -2$

NOTES

Name _____ Date _____

7.5

Exponential and Logarithmic Equations Practice

Problems 1 – 10. Solve each equation. Round answers to the nearest hundredth.

1. $3^x = 729$

2. $4^{3x} = 8$

3. $6^{n+1} = 3$

4. $15^{2m-3} = 250$

5. $8^x = 12$

6. $5^{x-1} = 9$

7. $4^{2n} - 3 = 15$

8. $5^{2k} = 72.6$

9. $4^{2x-7} = 64$

10. $1.5^{2k} - 12 = 74$

Problems 11 – 18. Solve each equation. Round answers to the nearest hundredth.

11. $\log 5x = 2$

12. $4 \log x = -8$

13. $2 \log x - \log 4 = 3$

14. $\log 3x - \log 5 = 1.5$

15. $\log(6x - 2) = 3$

16. $\log x - \log 9 = 1$

17. $\log x + \log(x + 3) = 1$

18. $\log(x + 4) - \log x = 1$

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

20. $\log_4(x + 6) + \log_4(x - 6) = 3$

Problems 21 – 24. Solve.

21. The amount A that principal P will be worth after t years at an interest rate r ; is compounded annually, is found by the formula $A = P(1 + r)^t$. If you had a graduation present of \$5000 from your parents and you decided to invest it in a mutual fund that earned 12% compounded annually, how long must you leave the money to have \$12,000?

22. A model for the population of the United States after 2000 is given by $P(t) = 281(1.0125)^t$ where t represents the years after 2000. What is the population estimate for 2020?

23. Matthew's parents raise his allowance by 25% each year. If his allowance is \$15 now, when will it reach \$30?

Practice Sets

Lesson Warm-Ups

3. Solve $\log(3x + 1) = 1$	4. Solve $\log(x + 3) - \log x = 2$
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Name _____ Date _____ Period _____	
Lesson 7.5 Exponential and Logarithmic Equations Warm-Up # 2	
1. Solve $5^{2x+3} = 125$	2. Solve. Round to the nearest ten thousandth. $5^x = 20$
3. Solve $\log(3x + 1) = 3$	4. Solve $\log(x + 3) + \log x = 1$

Form A	7.5 Exponential & Logarithmic Equations Form B
Name _____	Name _____
period _____	Date _____ Period _____
	1. Solve $3^{2x-1} = 27$
	2. Solve. Round to the nearest ten-thousandth. $4^x = 20$
	3. Solve. $\log(3x - 8) = 2$
	4. Solve. $\log x + \log(x - 9) = 1$

2. Solve. Round to the nearest ten-thousandth. $3^x = 15$
3. Solve. $\log(3x + 4) = 2$
4. Solve. $\log(x + 9) - \log x = 1$

Daily Lesson Quiz