

Warm Up

1) $\text{antilog } 3.25 = x$

2) $2\log(4x) - \log(2x) = \log(3x + 35)$

4) $\log(8x) - \log(4) + \log(5x) = 3$

5) A city's population is growing at 8% per year. How long will it take to grow from 2000 to 10000?

Warm Up

1) $\text{antilog } 3.25 = x$

$$10^{3.25}$$

$$1778.279$$

2) $2\log(4x) - \log(2x) = \log(3x + 35)$

$$\log 16x^2 - \log 2x = \log(3x + 35)$$

$$\log 8x = \log(3x + 35)$$

$$8x = 3x + 35$$

$$5x = 35$$

$$x = 7$$

$$4) \log(8x) - \log(4) + \log(5x) = 3$$

$$\log 2x + \log 5x = 3$$

$$\log 10x^2 = 3$$

$$x = 10$$

$$10^3 = 10x^2$$
$$1000 = 10x^2$$
$$100 = x^2$$

5) A city's population is growing at 8% per year. How long will it take to grow from 2000 to 10000?

$$y = A(1+r)^t$$

$$10000 = 2000(1+0.08)^t$$

$$5 = 1.08^t$$

$$\log_{1.08} 5 = t$$

$$20.912 \text{ years}$$

Practice Test

1. Evaluate $(8)^{\frac{4}{3}}$

2. Simplify the expression $(4x^3y^{-2})^{-2}$

$4^{-3} x^{-9} y^6$

$\frac{y^6}{64x^9}$

3. Simplify $y^{\sqrt{5}} \cdot y^{\sqrt{20}}$

4. Solve the equation $-5 = 2 - 8\sqrt[5]{x^4}$

5. Solve $4^{3x} \leq 16^{x+3}$

6. Write in logarithmic form $7^x = 2401$

$\log_7 2401 = x$

7. Evaluate $\log_5 \frac{1}{125}$

8. Write exponential form $\log_2 \frac{1}{8} = -3$

$2^{-3} = 1/8$

9. Find: $\log 0.00039$

10. antilog 2.3324

214.9810

11. $\ln 41,479$

Solve the equation or inequality.

12. $\log_4 x = -2$ **1/16**

13. $\log_4 51.6 = x$

14. $\log_4 x = -0.5$ **0.5** 15. $\log_{2401} x = -\frac{1}{2}$

16. $\log_{125} x = -\frac{2}{3}$ **1/25** 17. $\log_3(x+6) - \log_3 x > 4$

$125^{-2/3} = x$

18. Find $\log_2 14$ 19. $\log_3(x+9) - \log_3 x = 2$

$\frac{\log 14}{\log 2} \approx 3.8074$

20. $8^{t-5} = 4^{5t+2}$ 21. $8^{2a-9} \leq 23$

$(2^3)^{t-5} = (2^2)^{5t+2}$ **-19/7**

$2^{3t-15} = 2^{10t+4}$

$\begin{array}{r} 3t - 15 = 10t + 4 \\ -4 \quad -3t \\ \hline -19 = 7t \end{array}$

22. Evaluate: $\log_4 19$ 23. Evaluate $\ln e^{14}$

$\frac{\log 19}{\log 4} \approx 2.1240$

Solve 32.12

24. $108 = 6e^{0.09t}$

25. $3e^{-2x} - 5 = 2$

$x > -1.9143$

26. $e^{-2x} < 4$

27. The Parker family plan to save amount P each year for each of the children's college funds. They used the formula $P = A \left[\frac{(i)}{(1+i)^n - 1} \right]$, where A is the amount college tuition will cost in n years, and i is the yearly interest, to find the amount they must save for each child. In 18 years, Parkers expect college tuition to cost \$48,000.

a. How much must they save each year, per child, at an interest rate of 7.5%?

b. How much must they save per child if the interest rate is 8.25%?

28. Uranium-234 decays according to the equation $y = ae^{-2.77 \times 10^{-6}t}$ where t is in years. Find the approximate half-life of this substance.

$$1/2 = e^{-2.77 \cdot 10^{-6}t}$$

$$\ln 1/2 = -2.77 \cdot 10^{-6}t$$

$$\frac{\ln 1/2}{-2.77 \cdot 10^{-6}} = t$$

250,000 years

29. The future value F_n of an annuity type of investment is given by the

expression $F_n = P \left[\frac{\left(1 + \frac{r}{n}\right)^{nt} - 1}{\left(\frac{r}{n}\right)} \right]$, where P is the periodic payment, r is the

rate, t is time, n is the number of times compounded. Samantha plans to save \$2200 each year for 45 years, at an annual interest rate of 6.25%.

a. How much will she have in her account at the end of that time?

b. How much will she have if she saves for 40 years at an interest rate of 8.25%?

30. If Ramirez family deposits \$5000 in an saving account at 7.5% interest compounded continuously, how much will be in the account after 15 years?

$$A = Pe^{rt} \qquad A = 5000e^{0.075 \cdot 15}$$

$$A = \$15,401.08$$

31. Mexico City, Mexico, is the world's second largest metropolis and is also one of its fastest-growing cities with a projected growth rate of 3.2% per year. Its population in 1991 was 20,899,000 people. Use the formula $P = 20.899e^{0.032t}$ to predict its population P in millions with t equal to the number of years after 1991. What is the predicted population to the nearest thousand of Mexico City for the year 2010?

32. Find the amount of time required to double an amount at 6.63% if the interest is compounded continuously.

$$y = ae^{rt}$$

$$2 = e^{0.0663 \cdot t}$$

$$\ln 2 = 0.0663t$$

$$\frac{\ln 2}{0.0663} = t$$

$$10.45 = t$$

Test

1 - 20 Unit 8 topic questions (4 points each)

21 - 30 Review questions (2 points each)

ACTERIA GROWTH A certain strain of bacteria grows from 40 to 326 in 120 minutes. Find k for the growth formula $y = ae^{kt}$, where t is in minutes.

$$326 = 40e^{k120}$$

$$8.15 = e^{k120}$$

$$\ln 8.15 = 120k$$

$$1.75\% = k$$

INVESTMENT Carl plans to invest \$500 at 8.25% interest, compounded continuously. How long will it take for his money to triple?

$$1500 = 500e^{0.0825t}$$

$$3 = e^{0.0825t}$$

$$\ln 3 = 0.0825t$$

$$13.317 \text{ years}$$

<p>1. Write in exponential form: $\log_x y = z$</p> $x^z = y$	<p>2. Write in logarithmic form: $a^b = c$</p> $\log_a c = b$
<p>3. Solve: $5^x = 125$</p> $\log_5 125 = x$ $x = 3$	<p>4. Solve: $4^x + 7 = 52$</p> $4^x = 45$ $\log_4 45 = x$ 2.74
<p>1. Write in exponential form: $\log_x y = z$</p>	<p>2. Write in logarithmic form: $a^b = c$</p>
<p>3. Solve: $5^x = 625$</p> $\log_5 625 = x$ $x = 4$	<p>4. Solve: $4^x + 7 = 82$</p> $4^x = 75$ $\log_4 75 = x$ 3.11

5. Solve: $\log_4 324 = x$

4.170

6. Solve: $\log 4x = 3$

$$10^3 = 4x$$
$$1000 = 4x$$
$$\boxed{x = 250}$$

5. Solve: $\log_4 432 = x$

4.377

6. Solve: $\log 5x = 4$

$$10^4 = 5x$$
$$10000 = 5x$$
$$\boxed{x = 2000}$$

7. Solve: $\log_2(x+4) - \log_2(5) = 3$

$$\log_2 \frac{x+4}{5} = 3$$
$$2^3 = \frac{x+4}{5} \quad 40 = x+4$$
$$\boxed{x = 36}$$

8. $\log_4(5x+1) = 2$

$$4^2 = 5x+1$$
$$16 = 5x+1$$
$$15 = 5x \quad \boxed{x = 3}$$

7. Solve: $\log_2(x+6) - \log_2(5) = 4$

$$\log_2 \frac{x+6}{5} = 4$$
$$2^4 = \frac{x+6}{5} \quad 80 = x+6$$
$$\boxed{x = 74}$$

8. $\log_4(3x+1) = 2$

$$4^2 = 3x+1$$
$$16 = 3x+1$$
$$15 = 3x \quad \boxed{x = 5}$$

9. Solve: $\log_4(3x-5) = \log_4(2x+8)$

10. Solve:

<p>9. Solve: $\log_6(3x - 5) = \log_6(2x + 3)$</p> $\begin{array}{r} 3x - 5 = 2x + 3 \\ -2x \quad \quad +5 \end{array}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> $x = 8$ </div>	<p>10. Solve: $\log_5(x) + 2\log_5(3) = \log_5(18)$</p> <p style="text-align: right;">$3^2 = 9$</p> $\log_5 9x = \log_5 18$ $9x = 18$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> $x = 2$ </div>
<p>9. Solve: $\log_6(3x - 5) = \log_6(2x + 8)$</p> $\begin{array}{r} 3x - 5 = 2x + 8 \\ -2x \quad \quad +5 \end{array}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> $x = 13$ </div>	<p>10. Solve: $\log_5(x) + 2\log_5(3) = \log_5(18)$</p>

Partner Challenge: THIS IS NOT A RACE...

The goal is to turn in your sheet with no mistakes. I will check your answers and mark what is correct.

All correct the 1st time = 5 points

2nd time = 4 points

3rd time = 3 points

4th time = 2 points

5th time = 1 point