UNIT 2 - LESSON 8

Name Period Date

READY

Topic: Radicals and Rational exponents

Write the following radicals using exponents instead of radicals. Recall $\sqrt[m]{a^n} = (\sqrt[m]{a})^n = a^{\frac{n}{m}}$

1. $\sqrt[5]{x} = x^{\frac{1}{5}}$
2. $\sqrt[7]{s^2} = s^{\frac{2}{7}}$
3. $\sqrt[3]{w^8} = w^{\frac{8}{3}}$
4. $\sqrt[3]{8r^6} = 2r^2$
5. $\sqrt[5]{125m^5}$ $= 125^{\frac{1}{5}}m$
6. $\sqrt[3]{(8x)^2}$ $= \sqrt[3]{64x^2}$ $= 4x^{\frac{2}{3}}$
7. $\sqrt[3]{9b^8}$ $= 9^{\frac{1}{3}}b^{\frac{8}{3}}$
8. $\sqrt{75x^6}$ $= 75^{\frac{1}{2}}x^3$

Rewrite using a fractional exponent. Then find the answer.

9. $log_3 \sqrt[5]{3}$ $= \log_3 3^{\frac{1}{5}}$ $= \frac{1}{5}$
10. $log_2 \sqrt[3]{4}$ $= \log_2 4^{\frac{1}{3}}$ $= \log_2 2^{\frac{2}{3}}$ $= \frac{2}{3}$
11. $log_7 \sqrt[5]{343}$ $= \log_7 343^{\frac{1}{5}}$ $= \log_7 7^{\frac{3}{5}}$ $= \frac{3}{5}$
12. $log_5 \sqrt[3]{3125}$ $= \log_5 3125^{\frac{1}{3}}$ $= \log_5 5^1$ $= 1$

SET

Topic: Solving exponential equations algebraically

13. Rolesville is among the fastest growing towns in North Carolina. In 2017, the population of Rolesville was 7,666 and the growth rate was 9.33% (worldpopulationreview.com). If this trend continues, when will the population of Rolesville double?

$f(x) = 7,666(1.0933)^x$

When doubled: $15,332 = 7,666(1.0933)^x$

$2 = 1.0933^x$

$\log_{1.0933} 2 = x$ or $\log_{1.0933} 2 = \log_{1.0933} 1.0933^x$

$7.7707 = x$

≈ 8

∴ During the year 2024

14. The population of Askewville in 2016 was 229 and is declining at 3% per year (UNC Carolina Population Center). If this trend continues, when will the population of Askewville reach 100 residents? $f(x) = 229(.97)^x$

When reach 100

$100 = 229(.97)^x$

$\frac{100}{229} = .97^x$

$\log_{.97}\left(\frac{100}{229}\right) = x$

$27.2020 = x$ ∴ During the year 2043

Solve each of the exponential equations below algebraically. Then, check your answers graphically.

15. $9^n = 49$

$\log_9 49 = n$

$1.7712 = n$

16. $\left(\frac{1}{2}\right)^x = 15$

$\log_{\frac{1}{2}} 15 = x$

$-3.9069 = x$

17. $9^{a+10} + 3 = 81$

$9^{a+10} = 78$

$\log_9 78 = a+10$

$\log_9(78) - 10 = a$

$-8.0172 = a$

18. $20^{-6y} + 6 = 55$

$20^{-6y} = 49$

$\log_{20} 49 = -6y$

$\frac{\log 49}{\log 20} = -6y$

$-.2165 = y$

19. $8^{-5c} - 5 = 53$

$8^{-5c} = 58$

$\log_8 58 = -5c$

$\frac{\log 58}{\log 8} = -5c$

$-.3905 = c$

20. $5 \cdot 6^{3m} = 20$

$6^{3m} = 4$

$\log_6 4 = 3m$

$\frac{\log 4}{\log 6} = 3m$

$0.2579 = m$

21. $3 \cdot 1.25^{2x-3} + 9 = 500$

$3 \cdot 1.25^{2x-3} = 491$

$1.25^{2x-3} = \frac{491}{3}$

$\log_{1.25}\left(\frac{491}{3}\right) = 2x-3$

$12.9228 = x$

22. $6^{5x} - 9 = 81$

$6^{5x} = 90$

$\log_6 90 = 5x$

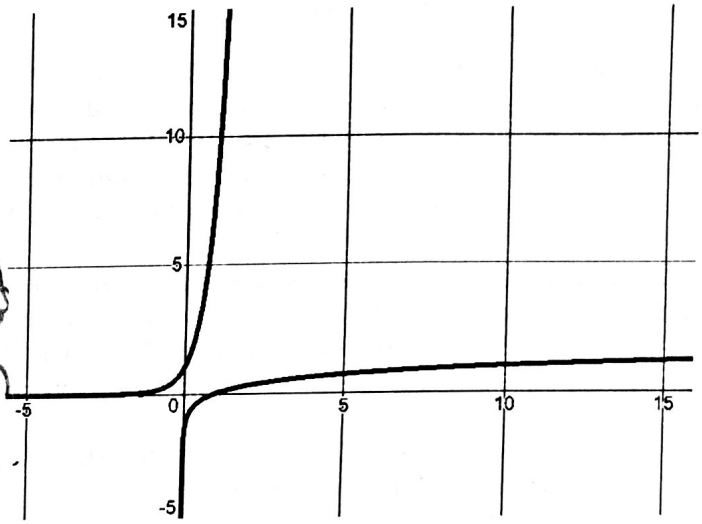
$\frac{\log 90}{\log 6} = 5x$

$0.5023 = x$

GO

Topic: Comparing graphs of exponential functions with their inverse. Solving simple logarithmic equations

23. The graphs of $f(x) = 10^x$ and $g(x) = logx$ are shown in the same coordinate plane. Make a list of the key characteristics of each function.



$f(x)$ Continuous
D: $(-\infty, \infty)$
R: $(0, \infty)$
x-int: None
y-int: (0,1)

Increasing over the entire domain $(-\infty, \infty)$
Hor. Asy. $y = 0$

$g(x)$ Continuous
D: $(0, \infty)$
R: $(-\infty, \infty)$
x-int: (1,0)
y-int: None

Increasing over the entire domain $(0, \infty)$
Ver. Asy. $x = 0$

State whether or not the following statements about $f(x) = 10^x$ and $g(x) = logx$ are true or false.

a. Every graph of the form $g(x) = logx$ will contain the point (1,0) True
(cont. of log(x))
b. Both graphs have vertical asymptotes. False
c. The graphs of *f(x)* and *g(x)* have the same rate of change. False
d. The functions are inverses of each other. True
e. The range of *f(x)* is the domain of *g(x)*. True
f. The graph of *g(x)* will never reach 3. False

Use your calculator to find the value of x. Round answers to 4 decimals.

24. $logx = -3$
$10^{-3} = x$
$.001 = x$

25. $logx = 1$
$10^1 = x$
$10 = x$

26. $logx = 0$
$10^0 = x$
$1 = x$

27. $logx = 0.5$
$10^{0.5} = x$
$3.1622 = x$

28. $logx = 1.75$
$10^{1.75} = x$
$56.2341 = x$

29. $logx = -2.2$
$10^{-2.2} = x$
$.0063 = x$