

16.1-16.3 Quiz Review

© 2014 Kuta Software LLC. All rights reserved.

Condense each expression to a single logarithm.

1)  $75 + 5 \log_2 7$

2)  $4 \log_3 w + \frac{\log_3 u}{3} = \log_3 w^4 + \frac{1}{3} \log_3 u$   
 mult.  
 $= \log_3 w^4 \sqrt[3]{u}$

3)  $25 \log_4 3 + 5 \log_4 8 = \log_4 3^{25} \cdot 8^5$   
 mult.

4)  $4 \log_5 7 + \frac{\log_5 12}{3} = \log_5 7^4 + \frac{1}{3} \log_5 12$   
 mult.  
 $= \log_5 7^4 \sqrt[3]{12}$

5)  $4 \log_3 a - 8 \log_3 b = \log_3 \frac{a^4}{b^8}$   
 div.

Expand each logarithm.

6)  $\log_8 (x^6 \cdot y)^6 = \log_8 x^{36} y^6$   
 add  
 $= \log_8 x^{36} + \log_8 y^6 = 36 \log_8 x + 6 \log_8 y$

7)  $\log_9 (z \sqrt[3]{x \cdot y}) = \log_9 z x^{1/3} y^{1/3}$   
 add  
 $= \log_9 z + \log_9 x^{1/3} + \log_9 y^{1/3} = \log_9 z + \frac{1}{3} \log_9 x + \frac{1}{3} \log_9 y$

8)  $\log_9 \left(\frac{2}{3^3}\right)^5 = \log_9 \frac{2^5}{3^{15}}$  ← sub.  
 $= \log_9 2^5 - \log_9 3^{15} = 5 \log_9 2 - 15 \log_9 3$

9)  $\log_7 \left(\frac{12}{5^2}\right)^5 = \log_7 \frac{12^5}{5^2}$  ← sub.  
 $= \log_7 12^5 - \log_7 5^2 = 5 \log_7 12 - 2 \log_7 5$

10)  $\log_7 (z \sqrt{x \cdot y}) = \log_7 z x^{1/2} y^{1/2}$   
 add  
 $= \log_7 z + \log_7 x^{1/2} + \log_7 y^{1/2} = \log_7 z + \frac{1}{2} \log_7 x + \frac{1}{2} \log_7 y$

Solve each equation. Round your answers to the nearest ten-thousandth.

11)  $17^{5v} + 9 = 65$   
 $17^{5v} = 56 \rightarrow \log_{17} 56 = 5v$   
 $1.42077 = 5v \rightarrow \boxed{0.2842 = v}$

12)  $12^{n+10} - 4 = 80$   
 $12^{n+10} = 84 \rightarrow \log_{12} 84 = n + 10$   
 $1.78309 = n + 10$   
 $\boxed{-8.2169 = n}$

13)  $14^{x+5} - 8 = 32$   
 $14^{x+5} = 40 \rightarrow \log_{14} 40 = x + 5$   
 $-3.602178 = x + 5$

14)  $6e^{v+5} = 26$   
 $e^{v+5} = \frac{26}{6}$   
 $\ln\left(\frac{26}{6}\right) = v + 5$   
 $1.46634 = v + 5$   
 $\boxed{-3.5337 = v}$

15)  $-4e^{8a} = -61$   
 $e^{8a} = 15.25$   
 $\ln 15.25 = 8a$   
 $2.72458 = 8a$   
 $\boxed{0.3406 = a}$

Solve each equation.

16)  $5^{3x} = 5^{3x}$

$3x = 3x \leftarrow$  all real #s

18)  $\log_3(-4n+6) = \log_3(4n+6)$

$-4n+6 = 4n+6$

$0 = 8n \rightarrow$   $0 = n$

20)  $\log_3 -3x - \log_3 6 = 3$

$\log_3 \frac{-3x}{6} = 3 \rightarrow \frac{3^3}{1} = \frac{-x}{2} \rightarrow 54 = -x$   
 $-54 = x$

22)  $\log_6 -4x - \log_6 8 = 1$

$\log_6 \frac{-4x}{8} = 1 \rightarrow \frac{6^1}{1} = \frac{-x}{2} \rightarrow 12 = -x$   
 $-12 = x$

24)  $\log_7 x + \log_7(x+14) = \log_7 51$

$\log_7(x^2+14x) = \log_7 51$

$x^2+14x-51 = 0$   $x=3, x=-17$

17)  $32^{2x-2} \cdot 16^{3x} = 1$

$(2^5)^{2x-2} \cdot (2^4)^{3x} = 1$

$2^{10x-10} \cdot 2^{12x} = 1$   
 $2^{22x-10} = 1$

$\log_2 1 = 22x-10$

$0 = 22x-10$

$10 = 22x$

$\frac{5}{11} = x$

19)  $\log_{10}(-2k+3) = \log_{10} -5k$

$-2k+3 = -5k$

$3 = -3k \rightarrow$   $-1 = k$

21)  $\log_9 -2x - \log_9 10 = \log_9 28$

$\log_9 \frac{-2x}{10} = \log_9 28 \rightarrow \frac{-x}{5} = \frac{28}{1} \rightarrow 140 = -x$   
 $-140 = x$

23)  $\log_2 3x - \log_2 7 = 3$

$\log_2 \frac{3x}{7} = 3 \rightarrow \frac{2^3}{1} = \frac{3x}{7} \rightarrow 56 = 3x$

$56/3 = x$

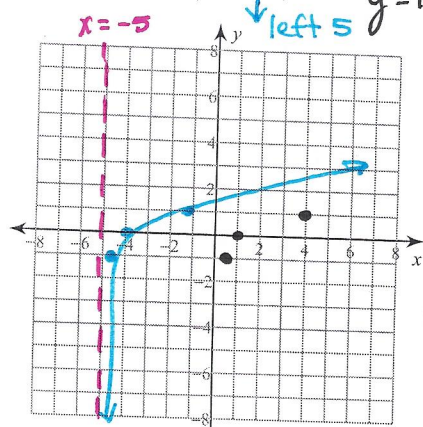
25)  $\log_4(x-6) - \log_4 x = 1$

$\log_4 \frac{x-6}{x} = 1 \rightarrow 4^1 = \frac{x-6}{x} \rightarrow 4x = x-6$   
 $3x = -6$   
 $x = -2$

No solution

Identify the domain and range of each. Then sketch the graph.

26)  $f(x) = \log_4(x+5)$

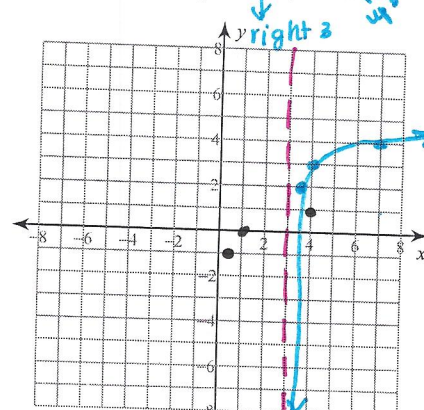


D:  $x > -5$   
 R:  $\mathbb{R}$

$y = \log_4 x$

$4^y = x$	
x	y
1/4	-1
1	0
4	1

27)  $f(x) = \log_4(x-3) + 3$



D:  $x > 3$   
 R:  $\mathbb{R}$

$y = \log_4 x$

$4^y = x$	
x	y
1/4	-1
1	0
4	1

Find the inverse of each function.

28)  $y = \log_3(x+10)$

$x = \log_3(y-10) \rightarrow y-10 = 3^x$   
 $y^{-1} = 3^x + 10$

29)  $y = \log_2 x^5$

$x = \log_2 y^5 \rightarrow y^5 = 2^x$

$y^{-1} = \sqrt[5]{2^x}$  or  $y^{-1} = 2^{x/5}$

30)  $y = 6^{x/3}$

$x = 6^{y/3} \rightarrow \log_6 x = y/3$

$3 \log_6 x = y \rightarrow$   $\log_6 x^3 = y^{-1}$

31)  $y = 3^{x/4}$

$x = 3^{y/4} \rightarrow y/4 = \log_3 x$

$y = 4 \log_3 x$

$y^{-1} = \log_3 x^4$