CCSS Advanced Algebra 4 Name:_____

AA4: Solving Logarithm and Exponential Equations

Solve each equation for x. Check your answers and remove any extraneous solutions.

1. $2^{4x-2} = 64$

$\log_2 \quad \log_2$

$4x-2=6$

$+2 \quad +2$

$\frac{4x}{4} = \frac{8}{4}$

$x=2$

2. $125^x = 25$

$\log_{125} \quad \log_{125}$

$x = 2/3$

3. $9^{x+2} = \frac{1}{27}$

$\log_9 \quad \log_9$

$x+2=-1.5$

$-2 \quad -2$

$x=-3.5$

4. $8^x = 12,143$

$\log_8 \quad \log_8$

$x = \frac{\log(12143)}{\log(8)}$

$x=4.52$

5. $9(4^x) = 36,864$

$\frac{9}{9} \quad \frac{}{9}$

$4^x = 4096$

$\log_4 \quad \log_4$

$x=6$

6. $2^{x-1} + 3 = 131$

$-3 \quad -3$

$\log_2 2^{x-1} = 128$

$\log_2$

$x-1=7$

$x=8$

7. $5^{4x+2} = 37,500$

$\log_5 \quad \log_5$

$4x+2 = \frac{\log(37500)}{\log(5)}$

$4x+2=6.54$

$-2 \quad -2$

$\frac{4x}{4} = \frac{4.54}{4}$

$x=1.135$

8. $5(3^{x+4}) = 320$

$\frac{5}{5} \quad \frac{}{5}$

$3^{x+4} = 64$

$\log_3 \quad \log_3$

$x+4=3.79$

$-4 \quad -4$

$x=-.21$

9. $16^{4x-2} = \frac{1}{64}$

$\log_{16} \quad \log_{16}$

$4x-2=-1.5$

$4x=.5$

$x=.125$

10. $\log_4(3x-5) = 3$

$4 \quad 4$

$3x-5=4^3$

$3x-5=64$

$+5 \quad +5$

$\frac{3x}{3} = \frac{69}{3}$

$3x=23$

11. $3 + 4\log_9(2x) = 15$

$-3 \quad -3$

$\frac{4\log_9(2x)}{4} = \frac{12}{4}$

$\log_9(2x) = 3$

$9 \quad 9$

$\frac{2x}{2} = \frac{729}{2}$

$x=364.5$

12. $2\log_5(3x) = 250$

$\frac{2}{2} \quad \frac{}{2}$

$\log_5(3x) = 125$

$5 \quad 5$

$\frac{3x}{3} = \frac{2.35\times10^{87}}{3}$

$x = 7.84\times10^{86}$

Beware of spicyness....

13. $\log_2(x^2-9) = 4$

$2 \quad 2$

$x^2-9=16$

$x^2=25$

$x=\pm5$

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

$3 \quad 3$

$(x-1)(x+2)=9$

$x^2+2x-1x-2=9$

$x^2+x-11=0$

$(x+.5)^2-11.25=0$

$(x+.5)^2=11.25$

$x+.5=3.35$

$x=2.85$

$x+.5=-3.35$

$x=-3.85$

15. $\log_{10}(x(x+15)) = 2$

$10 \quad 10$

$x(x+15)=100$

$x^2+15x-100=0$

$(x+20)(x-5)=0$

$x=-20, \quad x=5$

Find the inverse of each function. Check your answer by graphing, using a table, or function composition.

1. $f(x) = 3^x$

$y = 3^x$

$\log_3 y = x$

$\log_3 x = f^{-1}(x)$

2. $g(x) = \log_3(x)$

$y = \log_3(x)$

$3^y = x$

$3^x = g^{-1}(x)$

3. $h(x) = 5(3)^x$

$\frac{y}{5} = \frac{5(3)^x}{5}$

$\log_3 \frac{y}{5} = \log_3 3^x$

$\log_3 \left(\frac{y}{5}\right) = x$

$\log_3 \left(\frac{x}{5}\right) = h^{-1}(x)$

4. $a(x) = 5\log_6(x+7)$

$\frac{y}{5} = \frac{5\log_6(x+7)}{5}$

$6^{\frac{y}{5}} = 6^{\log_6(x+7)}$

$6^{\frac{y}{5}} = x+7$

$-7 \quad -7$

$6^{\frac{y}{5}} - 7 = x$

$6^{\frac{x}{5}} - 7 = a^{-1}(x)$

5. $b(x) = 7(9)^{x+5}$

$\frac{y}{7} = \frac{7(9)^{x+5}}{7}$

$\log_9 \frac{y}{7} = \log_9 9^{x+5}$

$\log_9 \left(\frac{y}{7}\right) = x+5$

$-5 \quad -5$

$\log_9 \left(\frac{y}{7}\right) - 5 = x$

$\log_9 \left(\frac{x}{7}\right) - 5 = b^{-1}(x)$

6. $c(x) = 12\log_5(x) - 7$

$+7 \quad +7$

$\frac{y+7}{12} = \frac{12\log_5(x)}{12}$

$5^{\frac{y+7}{12}} = 5^{\log_5(x)}$

$5^{\frac{y+7}{12}} = x$

$5^{\frac{x+7}{12}} = c^{-1}(x)$

7. $d(x) = .85(1.35)^{2x+3} - 5$

$+5 \quad +5$

$\frac{y+5}{.85} = \frac{.85(1.35)^{2x+3}}{.85}$

$\log_{1.35} \frac{y+5}{85} = \log_{1.35} (1.35)^{2x+3}$

$\log_{1.35} \left(\frac{y+5}{.85}\right) = 2x+3$

$-3 \quad -3$

$\log_{1.35} \left(\frac{y+5}{.85}\right) - 3 = 2x$

$\frac{\log_{1.35} \left(\frac{y+5}{.85}\right) - 3}{2} = \frac{2x}{2}$

$\frac{\log_{1.35} \left(\frac{y+5}{.85}\right) - 3}{2} = d^{-1}(x)$

8. $e(x) = 0.125\log_{1.25}(3.5x) - 5$

$e^{-1}(x) = \frac{1.25^{\frac{x+5}{0.125}}}{3.5}$

9. $p(x) = 1234(5)^{6x+7} - 8$

$p^{-1}(x) = \frac{\log_5 \left(\frac{x+8}{1234}\right) - 7}{6}$