Algebra 2 Worksheet Name: Key

Section 7.5 – Solving Exponential and Log Equations #1 Period: __

I. Rewrite the exponential equation so all the bases are the same. Then solve.

1. $5^x = \frac{1}{25}$ $5^{x} = 5^{-2}$ $\boxed{x=-2}$	2. $9^x = 27$ $(3^2)^x = 3^3$ $3^{2x} = 3^3$ $2x = 3$ $\boxed{x = \frac{3}{2}}$	3. $2^{-x} = 16$ $2^{-x} = 2^4$ $-x = 4$ $\boxed{x=-4}$
4. $3^x = 9^{x+1}$ $3^x = (3^2)^{x+1}$ $3^x = 3^{2(x+1)}$ $3^x = 3^{2x+2}$ $x = 2x+2$ $-x = 2$ $\boxed{x=-2}$	5. $4^{x-1} = 8^x$ $(2^2)^{x-1} = 2^3$ $2^{2(x-1)} = 2^3$ $2^{2x-2} = 2^3$ $2x-2 = 3$ $2x = 5$ $\boxed{x = \frac{5}{2}}$	6. $\left(\frac{1}{3}\right)^{\frac{x}{2}} = 3^{x-6}$ $(3^{-1})^{\frac{x}{2}} = 3^{x-6}$ $3^{-\frac{x}{2}} = 3^{x-6}$ $2\left(-\frac{x}{2} = x-6\right)$ $-x = 2x-12$ $-3x = -12$ $\boxed{x=4}$
7. $2^{3x-2} = \frac{1}{16}$ $2^{3x-2} = 2^{-4}$ $3x-2 = -4$ $3x = -2$ $\boxed{x = \frac{-2}{3}}$	8. $\left(\frac{1}{4}\right)^{2x} = \left(\frac{1}{2}\right)^x$ $(2^{-2})^{2x} = (2^{-1})^x$ $2^{-4x} = 2^{-x}$ $-4x = -x$ $-3x = 0$ $\boxed{x=0}$	9. $4^x = 8^{x-5}$ $(2^2)^x = (2^3)^{x-5}$ $2^{2x} = 2^{3(x-5)}$ $2^{2x} = 2^{3x-15}$ $2x = 3x-15$ $-x = -15$ $\boxed{x=15}$
10. $25^{2x} = 125^{x-3}$ $(5^2)^{2x} = (5^3)^{x-3}$ $5^{4x} = 5^{3(x-3)}$ $5^{4x} = 5^{3x-9}$ $4x = 3x-9$ $\boxed{x=-9}$	11. $\left(\frac{1}{8}\right)^x = 2^{x-6}$ $(2^{-3})^x = 2^{x-6}$ $2^{-3x} = 2^{x-6}$ $-3x = x-6$ $-4x = -6$ $\boxed{x = \frac{3}{2}}$	12. $\left(\frac{1}{5}\right)^{x-2} = 125^{\frac{x}{2}}$ $(5^{-1})^{x-2} = (5^3)^{\frac{x}{2}}$ $5^{-x+2} = 5^{\frac{3}{2}x}$ $2\left(-x+2 = \frac{3}{2}x\right)$ $-2x+4 = 3x$ $4 = 5x$ $\boxed{x = \frac{4}{5}}$

II. Solve by simplifying each logarithmic expression to a single logarithm and then rewriting in exponential form.

13. $\log_3 x = 2$ $3^2 = x$ $\boxed{x = 9}$	14. $\log(4x) = 2$ $10^2 = 4x$ $100 = 4x$ $\boxed{x = 25}$	15. $\log_3(x-12) = 2$ $3^2 = x - 12$ $9 = x - 12$ $\boxed{x = 21}$
16. $\log_4(2x+5) = 3$ $4^3 = 2x + 5$ $64 = 2x + 5$ $59 = 2x$ $\boxed{x = \frac{59}{2}}$	17. $2\log x = 4$ $\log x^2 = 4$ $10^4 = x^2$ $\sqrt{10000} = \sqrt{x^2}$ $x = \cancel{\pm} 100$ *can't take log of a negative number $\boxed{x = 100}$	18. $\log x - \log 4 = 1$ $\log \frac{x}{4} = 1$ $10^1 = \frac{x}{4}$ $10 = \frac{x}{4}$ $\boxed{x = 40}$
19. $\log 3x = 1 + \log 5$ $\log 3x - \log 5 = 1$ $\log \frac{3x}{5} = 1$ $10^1 = \frac{3x}{5}$ $10 = \frac{3x}{5}$ $3x = 50$ $\boxed{x = \frac{50}{3}}$	20. $2\log_5 x = 2 - \log_5 4$ $\log_5 x^2 + \log_5 4 = 2$ $\log_5 4x^2 = 2$ $5^2 = 4x^2$ $25 = 4x^2$ $\sqrt{x^2} = \sqrt{\frac{25}{4}}$ $x = \cancel{\pm} \frac{5}{2}$ $\boxed{x = \frac{5}{2}}$	21. $\log_2 8 - \log_2\left(\frac{x}{2}\right) = -1$ $\log_2 \frac{8}{\frac{x}{2}} = -1$ $\log_2 \left(8 \cdot \frac{2}{x}\right) = -1$ $\log_2 \frac{16}{x} = -1$ $2^{-1} = \frac{16}{x}$ $\frac{1}{2} = \frac{16}{x}$ $\boxed{x = 32}$

III. Use the change of base formula to evaluate each logarithm to the nearest hundredth.

22. $\log_2 12$ $\frac{\log 12}{\log 2}$ $\boxed{\approx 3.58}$	23. $\log_3 40$ $\frac{\log 40}{3}$ $\boxed{\approx 3.36}$	24. $\log_{11} 3$ $\frac{\log 3}{\log 11}$ $\boxed{\approx 0.46}$	25. $\log_{25} 100$ $\frac{\log 100}{\log 25}$ $\boxed{\approx 1.43}$