DName:_____ Date:_____

M12P HW Section 7.5 Solving Equations with Logarithms:

$\log_a b = \dfrac{\log b}{\log a}$ $\log a^m = m \log a$ $\log(a \times b) = \log a + \log b$ $\log(a \div b) = \log a - \log b$

1. How do you find the restrictions in a logarithm equation? Explain:

2. For each of following equations, find the restrictions on the variable "x".

a) $\log_2(2x-3) = 1$

b) $\log_x \sqrt{5-x} = 3$

c) $\log_3 \dfrac{1}{3x+4} = 5$

d) $\log_3(x^2 - x - 12) = 4$

e) $\log_3\left(\dfrac{2x+1}{x^2+3x-10}\right) = 2$

f) $\log_x \dfrac{\sqrt{x^2-10}}{x^2+25}$

3. Do these two equations have the same restrictions on the variable? Explain: $\log x^2$ and $2\log x$

4. Do these two equations have the same restrictions? Explain: $\log_2\left(\dfrac{x}{y}\right)$ and $\log_2 x - \log_2 y$

5. Solve the following equations for "x". make sure to check for Extraneous roots:

a) $\log_3 3x - \log_3 4 = \log_3 12$	b) $\log_9 x - \log_3 27 = 1$
c) $\log_4 (x-5) + \log_4 (x-2) = 1$	d) $\log_5 x - \log_5 (x-1) = \log_5 9$
e) $\log (2x+3) + \log (x+2) - 1 = 0$	f) $\log_3 (x+25) - \log_3 (x-1) = 3$
g) $\log_2 (x-2) + \log_2 (x+1) = 2$	h) $\log_3 (3x-2) + \log_9 (2x-1)^2 = 4$

6. Solve the following equations for "x" and also state the domain for 'x". indicate if there are any extraneous roots:

a) $\log_{49} (x+4) + \log_{49} (x-2) = \frac{1}{2}$	b) $\log_8 x + \log_8 (x+6) = \log_8 (5x+12)$

c) $\log_5(9x-2)-\log_5 x=\log_{25} 4$	d) $\log_2 x=2+\log_4(x-3)$
e) $\log_{16}(x+4)+\log_{16}(x-4)=\log_4 3$	f) $\log_2(1-x)-\log_2(3-x)=-0.5\log_2 4$
g) $\log_6(x+4)+\log_6(x-2)=\log_6 4x$	h) $\log(x+2)+\log(x-7)=2\log(x-4)$
i) $2\log 3x^2+3\log 4x^3=4\log 2x^2+4\log 6x$	j) $\log\sqrt{x+4}-\log\sqrt{x-4}=\log 3$
k) $\log_4(3x-2)-\log_4(4x+1)=2$	L) $\log_2 x+\log_4 x+\log_{16} x=21$

m) $\frac{1}{\log_2 x}+\frac{1}{\log_4 x}+\frac{1}{\log_8 x}=3$	n) $\log_3 x+\log_{243} x^5+3=0$

7. Use the logarithm rules to convert each back into exponential form and then solve algebraically. Make sure to indicate the restrictions on the variables and check for extraneous roots.

a) $\log_5\left(\log_x\left(2x-3\right)\right)=0$	b) $\log_2\left(\log_x\left(20-x\right)\right)=1$
c) $\log_3\left(\log_2\left(x^2-2x\right)\right)=1$	d) $\log_3\left(x^2-8x\right)=1$
e) $\log\left(\log_2\left(\log_x 36\right)\right)=0$	

8. Solve the following logarithms by factoring:

a) $\left(\log x\right)^2+\log\left(\frac{1}{x}\right)=12$	B) $2\left(\log_3 x\right)^3-\left(\log_3 x\right)^2=0$

c) $3\left(\log_3 x\right)^2 - 36 = \log_3 x^{23}$	d) $\log_4 x + 25\log_x 4 = 10$
e) $\log_2\left[251 + \log_3\left(x+7\right)\right] = 8$	f) $\log\frac{1}{x^2} + \log\frac{1}{x} + \log x + \log x^2 + \log x^3 = 6$
g) $\log\left(\log x\right) + \log\left(\log x^2 - 1\right) = 0$	h) $x^{\log_x x^6} = \log 10^{64}$
i)	j)