Name:____________________________ Date:___________________________

Math 12 Honours: Section 5.3 Solving Logarithmic Equations with Identities

1. Solve for “x” and state all the extraneous roots: Show your work:

a) $\log(6-x)-2\log x=0$	b) $\log_3 x^3-\log_3 3x=3$
c) $\log_2(x-3)+\log_2(x+1)=5$	d) $\log_7(x+1)+\log_7 x=\log_7 12$
e) $\log_4(16x-64)-\log_4(3x-34)=3$	f) $\log(x-7)+\log(x+2)=1$
g) $\log_3(3x+2)+\log_3 x=\log_3 56$	h) $\log x=\frac{2}{3}\log 27+2\log 2-\log 3$

i) $2\log_4 x+\log_4(x-2)-\log_4 2x=1$	j) $\log_2 16^{2x+1}=8$
l) $(\log_8 a)(\log_a 3a)(\log_{3a} x^2)=\log_a a^5$	m) $2\log(3-x)=\log 2+\log(22-2x)$
n) $2^{\log x^2}=3(2^{1+\log x})+16$	o) $\log_5(x+3)+\log_5(x-1)=1$
$\log_2(x+2)+5=8+\log_2 x$	$2\log x-\log(24-x)=\log 2$

$\log_2(2x+4)-\log_2(x-1)=3$	$\log_4 x+\log_2\sqrt{x-2}=1+\log_{16}(x-1)^2$

2. Solve for "x": $\log_a b+\log_{a^2} b=\log_{a^3} b^x$

3. Solve for "x": $\log_4 x-\log_x 16=\frac{7}{6}-\log_x 8$ [Euclid]

4. Determine all value(s) of "x" that satisfy the equation (find all the extraneous roots) [Euclid]
   $\log_{5x+9}\left(x^2+6x+9\right)+\log_{x+3}\left(5x^2+24x+27\right)=4$

5. If $\log_2 x,\ \left(1+\log_4 x\right),\ \log_8 4x$ are consecutive terms of a geometric sequence, determine the possible value(s) of "x". Euclid 2009

6. Find the product of the value(s) of "m" that satisfy this equation: $\left(\log_2 m\right)^2 + \log_2 m^3 = 10$ Brilliant

7. Determine all real numbers "x" for which $\left(\sqrt{x}\right)^{\log_{10} x} = 100$ [Euclid]

8. Determine all real numbers "x" for which $\left(\log_{10} x\right)^{\log_{10}\left(\log_{10} x\right)} = 10,000$ [Euclid]

9. Challenge: Given the two equations, find the value of "n" 2003 AIME

$\log \sin x + \log \cos x = -1$ and $\log\left(\sin x + \cos x\right) = 0.5\left(\log n - 1\right)$

10. Determine the number of ordered pairs (a,b) of integers such that $\log_a b + 6\log_b a = 5$, with $2 \le a \le 2005$, and $2 \le b \le 2005$. 2005 AIME