MHF 4U0 **Semester 2, 2008 - 2009**

Grade 12 Advanced Functions (University Preparation)
Unit 1 – Exponential and Logarithmic Functions – Quest on Mechanical Questions

Mr. N. Nolfi

Victim: _____

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1. *Complete* each of the following *statements*. **(8 KU)**

(a) $\log_9 729 =$ 3 because

$9^{3} =$ 729

(b) $\log_2 \frac{1}{512} =$ −9 because

$2^{-9} = \frac{1}{512}$ ← that's −9

(c) $\log_{\frac{1}{4}} 16 = -2$ because

$\left(\frac{1}{4}\right)^{-2} =$ 16

(d) $\log_{\sqrt{5}} 125 = 6$ because

$\sqrt{5}^{6} =$ 125

2. Rewrite

(a) $3a^2b = \log_x (a-b)^2$ in exponential form. **(2 KU)**

$x^{3a^2b} = (a-b)^2$

(b) $\left(\frac{a}{b}\right)^{y} = z$ in logarithmic form. **(2 KU)**

$y = \log_{\frac{a}{b}} z$ ← base is $\frac{a}{b}$

3. Use the laws of logarithms to *write* the following *expression* as a *single logarithm*. *Simplify* fully! **(4 APP)**

$\log\left[w(z-2)^5\right] + \log\left[w^3(z-3)\right] - \log\left[w^6(z-2)\right]$

$= \log\left[w(w-2)^5 w^3 (z-3)\right] - \log\left[w^6(z-2)\right]$

$= \log\left(\frac{w^4 (z-2)^{\frac{4}{3}}(z-3)}{w^6 (z-2)}\right)$

$= \log\left(\frac{(z-2)^4(z-3)}{w^2}\right)$

4. Evaluate. Show all work! **(3 APP)**

$\log_5\left(\frac{\sqrt[5]{125}}{625}\right)$

$= \log_5 \sqrt[5]{125} - \log_5 625$

$= \log_5 125^{\frac{1}{5}} - 4$

$= \frac{1}{5}\log_5 125 - 4$

$= \frac{1}{5}(3) - 4$

$= \frac{3}{5} - \frac{20}{5}$

$= -\frac{17}{5}$

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5. Solve each of the following equations.

(a) $3^{2x} = 7^{3x-1}$ **(3 APP)**

$\therefore \log(3^{2x}) = \log(7^{3x-1})$

$\therefore 2x\log 3 = (3x-1)\log 7$

$\therefore 2x\log 3 = 3x\log 7 - \log 7$

$\therefore 2x\log 3 - 3x\log 7 = -\log 7$

$\therefore x(2\log 3 - 3\log 7) = -\log 7$

$\therefore x = \dfrac{-\log 7}{2\log 3 - 3\log 7} = \dfrac{\log 7}{3\log 7 - 2\log 3} \doteq 0.53$

(b) $10^{w+2} - 10^{w} = 9900$ **(4 APP)**

$\therefore 10^{w}(10^{2} - 1) = 9900$

$\therefore 10^{w} = \dfrac{9900}{99}$

$\therefore 10^{w} = 100$

$\therefore w = 2$

(c) $2\log_3 a - \log_3 4 = 3\log_3 4$ **(3 APP)**

$\therefore 2\log_3 a = 3\log_3 4 + \log_3 4$

$\therefore 2\log_3 a = 4\log_3 4$

$\therefore \log_3 a^2 = \log_3 4^4$

$\therefore a^2 = 4^4 = (4^2)^2$

$\therefore a = \pm 4^2 = \pm 16$

$\therefore a = 16$ (since -16 does not satisfy the original equation $\rightarrow$ if $a = -16$, then $\log_3 a$ is undefined)

(d) $\log_2 z + \log_2 (z-2) = 3$ **(4 APP)**

$\therefore \log_2[z(z-2)] = 3$

$\therefore z(z-2) = 2^3$

$\therefore z(z-2) = 8$

$\therefore z^2 - 2z - 8 = 0$

$\therefore (z-4)(z+2) = 0$

$\therefore z - 4 = 0$ or $z + 2 = 0$

$\therefore z = 4$ or ~~$z = -2$~~ inadmissable

$\therefore z = 4$

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