PART A: NO CALCULATOR

1. Simplify:

a) $\dfrac{\left(10x^{\frac{5}{3}}y^{-5}\right)\left(9x^{\frac{4}{3}}y^{2}\right)}{6xy^{-7}}$

b) $\dfrac{5^{-4}+5^{-1}}{5^{-4}+5^{-2}}$

$= \dfrac{90x^3y^{-3}}{6xy^{-7}}$

4 $= 15x^2y^4$

$= \dfrac{\cancel{5^{-4}}(1+5^3)}{\cancel{5^{-4}}(1+5^2)}$

$= \dfrac{126}{26}$

$= \dfrac{63}{13}$

2. Evaluate.

a) $log_5 125$

b) $log_9 3 + 2log_9 3$

b) $log_3(\sqrt{27} \cdot 9) + log_4(8)$

$= 3$

$= 3\log_9 3$

5 $= 3(\frac{1}{2})$

$= \frac{3}{2}$

$= \log_3(3^{3/2} \cdot 3^2) + \log_4 8$

$= \log_3(3^{\frac{7}{2}}) + \log_4 8$

$= \frac{7}{2} + \frac{3}{2}$

$= 5$

3. Rewrite in either exponential/logarithmic form.

a) $log_d e = k$

b) $g^p = r$

2 $\therefore d^k = e$

$\therefore \log_g r = p$

4. Write as a single log:

$log_3 M + log_3 N + \frac{1}{2} log_3 P$

4 $= \log_3 MN + \log_3 P^{\frac{1}{2}}$

$= \log_3 MNP^{\frac{1}{2}}$

5. Solve for exact value(s).

$2log_5 x = log_5 50$

$\log_5 x^2 = \log_5 50$

$\therefore x^2 = 50$

$x = \pm\sqrt{50}$

$= \pm 5\sqrt{2}$

inadmissible

Please raise your hand to hand in this section of your test and receive the next section.

PART B: CALCULATOR PERMITTED **Name:** ______________________

1. Solve to exact value(s):

a) $2^{2x} - 4(2^x) = 32$

$2^{2x} - 4(2^x) - 32 = 0$

$(2^x - 8)(2^x + 4) = 0$

$\therefore 2^x = 2^3$ or $2^x = -4$

$\therefore x = 3$ no sol'n

b) $log_2(x - 3) - log_2(x + 1) = 3$

$\log_2\left(\frac{x-3}{x+1}\right) = 3$

$\therefore \frac{x-3}{x+1} = 8$

$x - 3 = 8x + 8$

$-11 = 7x$

inadmissible $x = \frac{-11}{7}$

$\therefore$ no solution

c) $log_3(x + 5) + log_3(x - 2) = 2log_3 4$

$\log_3(x^2 + 3x - 10) = \log_3 16$

$\therefore x^2 + 3x - 10 = 16$

$x^2 + 3x - 26 = 0$

$\therefore x = \frac{-3 \pm \sqrt{9 + 104}}{2}$

$= \frac{-3 \pm \sqrt{113}}{2}$

inadmissible

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d) $4^{x^2-3} = \left(\frac{1}{16}\right)^{5x+3} \times 64^{-2}$

$4^{x^2-3} = (4^{-10x-6})(4^{-6})$

$4^{x^2-3} = 4^{-10x-12}$

$\therefore x^2 - 3 = -10x - 12$

$x^2 + 10x + 9 = 0$

$(x + 9)(x + 1) = 0$

$\therefore x = -9$ or -1

e) $5(3^{x-1}) = 4(27^x)$

$\log[5(3^{x-1})] = \log[4(27^x)]$

$\log 5 + \log 3^{x-1} = \log 4 + \log 27^x$

$\log 5 + (x-1)\log 3 = \log 4 + x\log 27$

$\log 5 + x\log 3 - \log 3 = \log 4 + x\log 27$

$x(\log 3 - \log 27) = \log 4 - \log 5 + \log 3$

$x(-2\log 3) = -\log 5 + \log 4 + \log 3$

$x = \frac{\log 5 - \log 4 - \log 3}{2\log 3}$

f) $2^{2x-1} + 2^{2x-5} = 272$

$2^{2x-5}(2^4 + 1) = 272$

$2^{2x-5}(17) = 272$

$2^{2x-5} = 2^4$

$\therefore 2x - 5 = 4$

$x = \frac{9}{2}$

2. Prove that $\frac{1}{log_3 x} + \frac{2}{log_4 x} + \frac{1}{log_5 x} = \frac{1}{log_{240} x}$

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$LS = \log_x 3 + 2\log_x 4 + \log_x 5$

$= \log_x 15 + \log_x 16$

$= \log_x 240$

$= \frac{1}{\log_{240} x}$

3. If $log_b x = 7$, find the value of $log_b(x\sqrt{x})$

① ②

$\therefore b^7 = x$

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sub ① in ②

$\therefore \log_b(b^7\sqrt{b^7})$

$= \log_b(b^7 \cdot b^{\frac{7}{2}})$

$= \log_b(b^{\frac{21}{2}})$

$\therefore \frac{21}{2}$

or

$\log_b x + \log_b \sqrt{x}$

$= \log_b x + \frac{1}{2}\log_b x$

$= 7 + \frac{7}{2}$

$= \frac{21}{2}$

4. If $log_b a = x^2$ and $log_a b = \frac{9}{x^4}$, show that $x = \pm 3$.

① ②

$\therefore b^{x^2} = a$ $\therefore a^{\frac{9}{x^4}} = b$

sub ① in ②

$(b^{x^2})^{\frac{9}{x^4}} = b$

$b^{\frac{9}{x^2}} = b$

$\therefore \frac{9}{x^2} = 1$

$x^2 = 9$

$x = \pm 3$.