Algebra 2 **Name:** Key **Block:** ________

Unit 5, Test 1 Review– Exponential and Logarithmic Functions

Note: Page 1 and 2 of this review are to all be completed **without** a calculator. All problems on page 3 are to be completed **with** a calculator. ~~There will be~~

1) Jack evaluated and solved the following logarithm problems. Some are correct and some are incorrect. Analyze each problem Jack did. If the problem is correct, justify the process Jack used. If the answer is incorrect, then explain what he did wrong and correct the mistake if possible. (3 points each)

a) Evaluate: $\log_2(\frac{1}{16})$ $2^? = 16$	b) Solve: $3 = \log_x 64$ $x^3 = 64$	c) Solve: $m = \log_4(32)$ $m^4 = 32$
a) Answer: 4	b) Answer: $x = 4$	c) Answer: $m \approx 2.378$
It should be $2^? = \frac{1}{16}$ the anwer is -4	this is correct	S/B $4^m = 32$ $m = 5/2$

2) Write the expression as an exponential expression:

a. $log_9 5 = 2x$

$9^{2x} = 5$

b. $\log(x + 4) = 5x$

$10^{5x} = x + 4$

3) Write the expression as a logarithmic expression:

a. $y^{3-x} = 7$

$3 - x = \log_y(7)$

b. $7^x = 12$

$x = \log_7(12)$

4) Condense the expressions:

a. $\frac{1}{2}log_5 x + log_5 y + \frac{1}{3}log_5 64$

$\log_5 x^{1/2} + \log_5 y + \log_5 64^{1/3}$

$\log_5 x^{1/2} + \log_5 y + \log_5 4$

$\log_5(4x^{1/2}y)$

b. $4ln2 - ln3 + \ln 4$

$\ln 2^4 - \ln 3 + \ln 4$

$\ln 16 - \ln 3 + \ln 4$

$\ln\left(\frac{16 \cdot 4}{3}\right) = \ln\left(\frac{64}{3}\right)$

5) Expand the expressions:

a. $\ln(4a^3b^4) = \ln 4 + \ln a^3 + \ln b^4$

$= \ln 4 + 3\ln a + 4\ln b$

b. $log_x \frac{\sqrt{wx}}{y^3} = \log_x \frac{w^{1/2}x}{y^3}$

$= \log_x w^{1/3} + \log_x X - \log_x y^3$

$= \frac{1}{3}\log_x w + \log_x x - 3\log_x y$

or $\frac{1}{3}\log_x w + 1 - 3\log_x y$

6) Evaluate the logarithm:

a. $log_3 81 =$ 4

$3^{\text{to what?}} = 81$

think

b. $log_{1/3} 27 =$ −3

$\left(\frac{1}{3}\right)^x = 27$

$x = -3$

c. $log_2\left(\frac{1}{32}\right) =$ −5

$2^{?} = \frac{1}{32}$

7) Solve the exponential equation:

a. $5^{4x-5} = 5^{2x+15}$

$4x - 5 = 2x + 15$

$2x = 20$

$x = 10$

b. $2^{x+1} = \left(\frac{1}{64}\right)^{x+1}$

$2^{x+1} = (2^{-6})^{x+1}$

$x + 1 = -6x - 6$

$7x = -7$

$x = -1$

8) Solve the logarithmic equation. Remember to check for extraneous solutions.

a. $\ln(2x - 1) = \ln(-4x - 13)$

$2x - 1 = -4x - 13$

$6x = -12$

$x \neq -2$

extraneous

so no solution

b. $\log(x - 21) - 1 = 2$

$\log(x - 21) = 3$

$10^3 = x - 21$

$1000 = x - 21$

$\boxed{x = 1021}$

c. $log_3(x + 1) - log_3 x = 1$

$\log_3\left(\frac{x+1}{x}\right) = 1$

$3^1 = \frac{x+1}{x}$

$3x = x + 1$

$2x = 1$

$\boxed{x = \frac{1}{2}}$

d. $log_6 x + log_6(x + 5) = 2$

$\log_6(x^2 + 5x) = 2$

$6^2 = x^2 + 5x$

$0 = x^2 + 5x - 36$

$0 = (x + 9)(x - 4)$

$x \neq -9$ or $\boxed{x = 4}$

9) Simplify each expression, show supporting work below:

a. $\left(\frac{2x^3y^6}{y^5}\right)^3 = \frac{2^3 x^9 y^{18}}{y^{15}}$

$= \boxed{8x^9y^3}$

b. $\frac{2x^6y^{-1}}{3xy^3} \cdot \frac{5x^{-7}y^3}{15x^2y^{-4}} = \frac{10x^{-1}y^2}{45x^3y^{-4}}$

$= \frac{2y^3}{9x^4}$

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Unit 5, Test 1 – Exponential and Logarithmic Functions

Calculator Section

11) Solve the equations (round to three decimal places if necessary):

a) $e^x + 3 = 4$

$e^x = 1$

No calculator needed.

$x = \ln 1$

$x = 0$

b) $2^{x+5} + 3 = 12$

$2^{x+5} = 9$

$x + 5 = \log_2 9$

$x = \log_2(9) - 5$ put in calc.

$x \approx -1.83$

c) $e^{5p-8} = 14$

$5p - 8 = \ln 14$

$5p = \ln(14) + 8$

$p = \frac{\ln(14) + 8}{5}$ Now put in calculator

$p \approx 2.13$

d) $9 \ln x = 54$

$\ln x = 6$

$e^6 = x$

$x \approx 403.43$

10) Approximate the value of $log_{12}(25)$ to the nearest hundredth.

≈ 1.30