Key

Take-home Quiz: Pre-Calculus

Exponential & Logarithmic Functions – Chapter 4 Review Problems

1. Find each exact value without a calculator. 6pts

a) $\log_2\left(\frac{1}{8}\right)$ a) -3

b) $\log_4 16$ b) 2

c) $\log_2 16$ c) 4

d) $\log_{\frac{1}{3}} 243$ d) -5

e) $\ln \sqrt[2]{e^3} = \ln e^{3/2}$ e) $3/2$

f) $5^{\log_5 7.3}$ f) 7.3

2. ***True*** or ***False***. (Please write a word as your answer.) 4pts

a) The graphs of $y = 5^x$ and $y = \left(\frac{1}{5}\right)^{-x}$ are identical. $y = (5^{-1})^{-x}$

a) True

b) The domain of $y = \log_7 (x + 2)$ is the same interval as the range of $y = 7^x - 2$.

$D_{log} = (-2, \infty)$

$R_{exp} = (-2, \infty)$

b) True

c) A *logarithm* is a name for a certain exponent.

c) True

d) $\dfrac{\log_8 12}{\log_8 6} = \log_8 2$ d) False

3. Find the domain of each logarithmic function. 2

a) $f(x) = \log (3x - 8)$

$3x - 8 > 0$

$x > \frac{8}{3}$

$D_f = \left(\frac{8}{3}, \infty\right)$

b) $g(x) = \log_2 (x^2 - 3x + 2)$

$(x-2)(x-1) > 0$

$x = 2 \quad x = 1$

$D_g = (-\infty, 1) \cup (2, \infty)$

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1 2

4. Expand. (Express as a sum and/or difference of logs.) 2

a) $\log_3 \dfrac{uv^2}{w}$, $u > 0$, $v > 0$, $w > 0$

$\log_3 u + 2\log_3 v - \log_3 w$

b) $\ln\left(\dfrac{2x+3}{x^2 - 3x + 2}\right)$, $x > 2$

$\ln(2x+3) - \ln(x-1) - \ln(x-2)$

5. Condense. (Write as a single logarithm.) 2

a) $3\log_4 x^2 + \frac{1}{2}\log_4 \sqrt{x}$

$\log_4 (x^2)^3 + \log_4 (x^{1/2})^{1/2}$

$\log_4 x^6 + \log_4 x^{1/4} = \log_4 x^6 \cdot x^{1/4}$

$= \log_4 x^{\frac{24+1}{4}} = \log_4 X^{\frac{25}{4}}$

b) $\frac{1}{2}\ln(x^2 + 1) - 4\ln\frac{1}{2} - \frac{1}{2}[\ln(x - 4) + \ln x]$

$\ln\sqrt{x^2+1} - \ln\left(\frac{1}{2}\right)^4 - \frac{1}{2}(\ln x^2 - 4x)$

$\ln \dfrac{\sqrt{x^2+1}}{\left(\frac{\sqrt{x^2-4x}}{16}\right)} = \ln 16\sqrt{\dfrac{x^2+1}{x^2-4x}}$

6. Use the Change-of-Base Formula and a calculator to approximate the values of the following expressions to three decimal places. 2

a) $\log_2 21$ a) 4.392

b) $\log_\pi \sqrt{5}$ b) 0.703

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Solve. Sta

13. $4^{x^2} \cdot 2^{5x} = 8$

$2^{2x^2} \cdot 2^{5x} = 2^3$

$2^{2x^2+5x} = 2^3$

$2x^2 + 5x - 3 = 0$

$(2x-1)(x+3) = 0$

$x = \frac{1}{2}$ $x = -3$

Both check, so $x = \frac{1}{2}$, $x = -3$

14. $\log(7x - 12) = 2 \log x$

$\log(7x-12) = \log x^2$

$7x - 12 = x^2$

$0 = x^2 - 7x + 12$

$0 = (x-4)(x-3)$

$X = 4$ $X = 3$

Both check, So $X = 4$ or $X = 3$.

15. $\log_3 \sqrt{x-2} = 2$

$3^2 = \sqrt{x-2}$

$9 = \sqrt{x-2}$

$81 = x - 2$

$\boxed{83 = x}$ ✓

16. $\log_6(x + 3) + \log_6 (x + 4) = 1$

$\log_6 (x+3)(x+4) = 1$

$6^1 = x^2 + 7x + 12$

$0 = x^2 + 7x + 6$

$0 = (x+6)(x+1)$

~~$x = -6$~~ $\boxed{x = -1}$

$x = -1$ Checks

17. $e^{1-2x} = 4$

$\ln e^{1-2x} = \ln 4$

$(1-2x)(\ln e) = \ln 4$

$(1-2x) = \ln 4$

$-2x = -1 + \ln 4$

$x = -\frac{1}{2}(-1 + \ln 4)$

$x \approx -0.193$

18. $5^{x+2} = 7^{x-2}$

$(x+2)\ln 5 = (x-2) \ln 7$

$x \ln 5 + 2 \ln 5 = x \ln 7 - 2 \ln 7$

$x \ln 5 - x \ln 7 = -2\ln 5 - 2\ln 7$

$x(\ln 5 - \ln 7) = -2\ln 5 - 2\ln 7$

$x = \dfrac{-2\ln 5 - 2\ln 7}{\ln 5 - \ln 7}$

$x \approx 21.13$