MATH 1005: College Algebra
Spring 2019 – April 19
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Answer Key
Quiz 10 – 4.2 & 4.3
Total: 25 / 25

*Show **all** of your work in the space provided. Clearly indicate your final answer.*

1. Convert the following exponential equations to logarithmic equations. 4 / 4

   a) $4^{-2} = \frac{1}{16}$ b) $\left(\frac{1}{3}\right)^{-3} = 27$

> **Solution:**
>
> a) $\log_4 \frac{1}{16} = -2$ b) $\log_{\frac{1}{3}} 27 = -3$

2. Convert the following logarithmic equations to exponential equations. 4 / 4

   a) $\log_{25}(125) = \frac{3}{2}$ b) $\ln x = y$

> **Solution:**
>
> a) $25^{\frac{3}{2}} = 125$ b) $e^y = x$

3. Find the domain of the logarithmic function $f(x) = \log_4(x-5)$. 3 / 3

> **Solution:** The argument of the logarithm (any base) must be strictly positive. So $x - 5 > 0$, which means $x > 5$, meaning the domain of f is $(5, \infty)$.

4. Use rules of logarithms to change the given expressions as directed. 5 / 5

   a) Write $\log(a\sqrt[3]{b})$ in expanded form.

   b) Write $\frac{5}{2}\ln x + 3\ln y$ in condensed form.

Solution:

a) $\log(a\sqrt[3]{b}) = \log a + \log\sqrt[3]{b} = \log a + \log b^{\frac{1}{3}} = \log a + \dfrac{1}{3}\log b.$

b) $\dfrac{5}{2}\ln x + 3\ln y = \ln x^{\frac{5}{2}} + \ln y^3 = \ln\sqrt{x^5} + \ln y^3 = \ln\left(\sqrt{x^5}\,y^3\right).$

5. Given that $\log_3 x = 2$ and $\log_3 y = 4$, evaluate the following. 5 / 5

a) $\dfrac{\log_3 xy}{\log_3 x}$

b) $\log_3\left(\frac{1}{4}x\right) + \log_3(4x)$

Solution:

a) $\dfrac{\log_3 xy}{\log_3 x} = \dfrac{\log_3 x + \log_3 y}{\log_3 x} = \dfrac{2+4}{2} = 3.$

b) $\log_3\left(\frac{1}{4}x\right)+\log_3(4x) = \log_3\left(\left(\frac{1}{4}x\right)(4x)\right) = \log_3(x^2) = 2\log_3 x = 2\cdot 2 = 4.$

6. Evaluate $\left(2^{\log_2 5} + \log_2 8\right)^{\log_x x^2}$. 4 / 4

Solution: The number $\log_2 5$ is the number so that 2 raised to that number is 5. We don't know what the number is without a calculator, but if we raise 2 to such a number, we get 5, i.e. $2^{\log_2 5} = 5$.

The number $\log_2 8$ is the number so that 2 raised to that number is 8, and we can compute that without a calculator: $\log_2 8 = 3$.

Finally, $\log_x x^2$ is the number so that when x raised to that number is x^2, so $\log_x x^2 = 2$. So

$$\left(2^{\log_2 5} + \log_2 8\right)^{\log_x x^2} = (5+3)^2 = 8^2 = 64.$$