Pre-Calculus 12 | 5.1 – 5.3 Logarithms Quiz | Name: KEY

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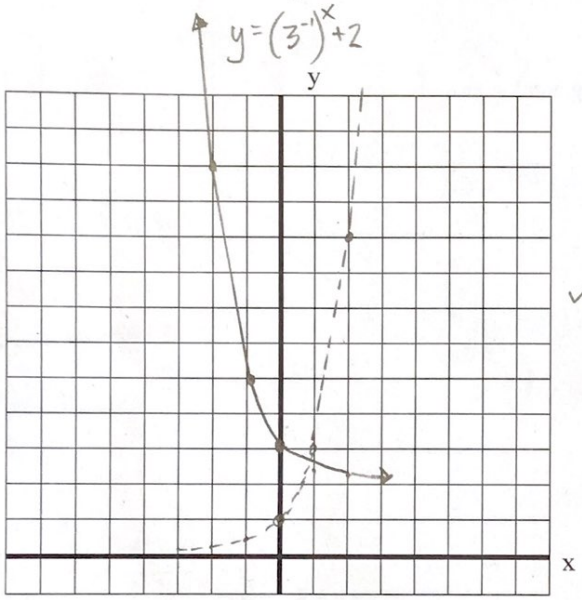
1. Solve for x: $9^{2x+1} = (\frac{1}{27})^{x+2}$

$(3^2)^{2x+1} = (\frac{1}{3^3})^{x+2}$ ✓ $\longrightarrow$ $3^{4x+2} = (3^{-3})^{x+2}$ $\longrightarrow$ $3^{4x+2} = 3^{-3x-6}$ ✓

since the bases are =, the exponents must be =

$\therefore\ 4x+2 = -3x-6 \longrightarrow 7x = -8 \longrightarrow \boxed{x = -8/7}$ ✓

2. Graph the equation $y = (\frac{1}{3})^x + 2$



✓

$y = 3^x$ ✓

x	y
-3	1/27
-2	1/9
-1	1/3
0	1
1	3
2	9
3	27

$y = 3^{-x} + 2$ ✓

x	y
3	2 1/27
2	2 1/9
1	2 1/3
0	3
-1	5
-2	11
-3	29

3. Find the base for the function $y = b^x$ that contains the point $(\frac{-2}{3}, \frac{1}{9})$.

$1/9 = b^{-2/3}$ ✓ $\longrightarrow$ $1/9 = \frac{1}{b^{2/3}}$ $\therefore$ $\longrightarrow$ $9 = b^{2/3}$ ✓ $\longrightarrow$ $9^{3/2} = b$

$(\sqrt{9})^3 = 3^3 = \boxed{27}$ ✓

4. How many more times powerful is an earthquake measuring 8.3 on the Richter Scale than one that measures 6.4?

$\frac{10^{8.3}}{10^{6.4}} = 10^{8.3-6.4} = 10^{1.9} = \boxed{79.4 \text{ times more powerful}}$ ✓

5. Radioactive argon-39 has a half-life of 4 minutes. If we initially have 84 grams of argon-39, how much remains after 23 minutes?

$A = 84(0.5)^{23/4}$ ✓

$\boxed{A = 1.56g}$ ✓

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6. Write the logarithmic equation $\log_3 81 = 4$, in exponential form.

$$\boxed{3^4 = 81}$$ ✓

7. Write the exponential equation $10^{-2} = 0.01$, in logarithmic form.

$$\boxed{\log 0.01 = -2}$$ ✓

8. Evaluate the function $f(x) = \log_{16} 4$ without using a calculator.

$$y = \log_{16} 4 \longrightarrow 16^y = 4 \longrightarrow (4^2)^y = 4$$ ✓ ✓

$$\longrightarrow 4^{2y} = 4^1 \longrightarrow 2y = 1 \longrightarrow \boxed{y = \tfrac{1}{2}}$$ ✓

9. Given $\log_7 x = -2$, find the value of x without using a calculator.

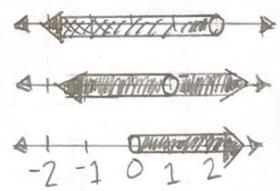
$$7^{-2} = x \longrightarrow \frac{1}{7^2} = x \longrightarrow \boxed{x = \frac{1}{49}}$$ ✓

10. Determine the domain of $f(x) = \log_{(2-x)} x$

$$2 - x > 0 \longrightarrow -x > -2 \longrightarrow x < 2$$

$$2 - x \neq 1 \longrightarrow -x \neq 1 - 2 \longrightarrow -x \neq -1 \longrightarrow x \neq 1$$

$$x > 0$$



$$\boxed{0 < x < 2,\ x \neq 1}$$ ✓

11. Determine the inverse of the function $f(x) = 2 + \log(5x-3)$

$$y = 2 + \log(5x-3) \xrightarrow[x \text{ \& } y]{\text{switch}} x = 2 + \log(5y-3)$$ ✓

$$\longrightarrow x - 2 = \log(5y-3) \xrightarrow[\log]{\text{defn of}} 10^{x-2} = 5y - 3 \longrightarrow 5y = 10^{x-2} + 3$$ ✓

$$\longrightarrow y = \frac{10^{x-2} + 3}{5}$$

$$\boxed{f^{-1}(x) = \frac{10^{x-2} + 3}{5}}$$ ✓

12. Write $\log 0.36$ in terms of log 2 and log 3.

$$= \log \frac{36}{100} = \log 36 - \log 100 = \log(4 \times 9) - 2$$ ✓

$$= \log 2^2 + \log 3^2 - 2 = \boxed{2\log 2 + 2\log 3 - 2}$$ ✓

13. Determine the exact value of $\log_2 \frac{1}{32}$

$$= \log_2\left(\frac{1}{2^5}\right) = \log_2 2^{-5} = -5\log_2 2 = \boxed{-5}$$ because $\log_b b = 1$

✓ ✓