Pre-Calculus Test Review Name Key

Exponential, Logistic & Logarithmic Unit Date: ______ Period: ____

Calculator Inactive

Use the properties of exponents to expand:

1. $\log_3 \frac{x^3 y}{3z}$

$3\log_3 x + \log_3 y - 1 - \log_3 z$

2. $\log_8 \frac{\sqrt{xy}}{3}$

$\frac{1}{2}\log_8 x + \frac{1}{2}\log_8 y - \log_8 3$

Solve:

3. $3\log_2 x + 1 = 7$

$3\log_2 x = 6$
$\log_2 x = 2$
$\underline{x = 4}$

4. $\log \sqrt[3]{10} = x$

$\sqrt[3]{10} = 10^x$
$10^{1/3} = 10^x$
$\underline{x = 1/3}$

5. $\ln \frac{1}{e^7}$

$\ln 1 - \ln e^7$
$0 - 7\ln e$
$\underline{-7}$

6. Afghanistan suffered two major earthquakes in 1998. The first had a magnitude of $R = 6.1$ and the second had a magnitude of $R = 6.9$. Use $\log\frac{a}{T} + B$ to find how many times more powerful the second quake was. Assume that the values of B and T are equal for both earthquakes.

$R_2 - R_1 = \log a_2 - \log a_1$
$6.9 - 6.1 = \log \frac{a_2}{a_1}$
$.8 = \log \frac{a_2}{a_1}$

$\frac{a_2}{a_1} = 10^{.8} \approx 6.310$ times more powerful

7. Write the exponential function that satisfies the conditions: Initial population = 67000, decreasing at a rate of 1.67% per year.

$y = a(1-r)^x$
$y = 67000(1-.0167)^x$

$\underline{y = 67000(0.9833)^x}$

8. Write the exponential function that satisfies the conditions: Initial population = 67000, increasing at a rate of 1.67% per year.

$y = a(1+r)^x$
$\underline{y = 67000(1.0167)^x}$

9. Rewrite as an exponential expression: $\log_3 \frac{3}{8} = x$.

$3^x = \frac{3}{8}$

10. Condense and simplify: $2\ln xy^2 - 3\ln y$.

$\ln x^2y^4 - \ln y^3$
$\ln \frac{x^2y^4}{y^3}$

$\underline{\ln x^2 y}$

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Calculator Active:

Solve: If there are any extraneous solutions, tell why they are extraneous.

11. $4^{x+3} = 7^{x}$

$(x+3)\ln 4 = x \ln 7$

$\frac{x+3}{x} = \frac{\ln 7}{\ln 4}$

$x \approx 7.432$

12. $\log(x+2) + \log(x-1) = 4$

$\log(x^2 + x - 2) = 4$

$x^2 + x - 2 = 10{,}000$

$x^2 + x - 10002 = 0$

$x = \frac{-1 \pm \sqrt{40009}}{2}$

$x \approx 99.511$

$x \neq \frac{-1-\sqrt{40009}}{2}$

not real

12. $\frac{50}{4+e^{2x}} = 11$

$e^{2x} = .54\overline{5}$

$x = \frac{\ln(.\overline{54})}{2}$

$x \approx -0.303$

13. The number P of students infected with the flu at Olympia High School t days after exposure is modeled by: $P(t) = \frac{300}{1+e^{4-t}}$

a. What was the initial number of students infected with the flu?

$P(0) = \frac{300}{1+e^4}$

$P(0) \approx 5.39$

about 5 students

b. When will 100 students be infected?

$x \approx 3.307$ days, on the 4th day

c. What would be the maximum number of students infected?

300 students

14. The pH of sea water is 7.6 and the pH of milk of magnesia is 10.5.

a. What are the hydrogen ion concentrations of each?

sea walter $-\log H^+ = 7.6 \Rightarrow 10^{-7.6} \approx 2.512 \times 10^{-8}$ moles/Liter

milk of magnesia $= 10^{-10.5} \approx 3.162 \times 10^{-11}$ moles/Liter

b. How many times greater is the hydrogen-ion concentration of sea water than of milk of magnesia?

$\frac{10^{-7.6}}{10^{-10.5}} = 10^{-7.6-(-10.5)} = 10^{2.9} \approx 794.33$

15. Graph the function and analyze: $e^{x^2-5} - 2 = f(x)$

Domain: $(-\infty, \infty)$

$x^2 - 5 \geq 0$

$x \geq \pm\sqrt{5}$

Range: $[-2, \infty)$

Increasing on interval: $(0, \infty)$

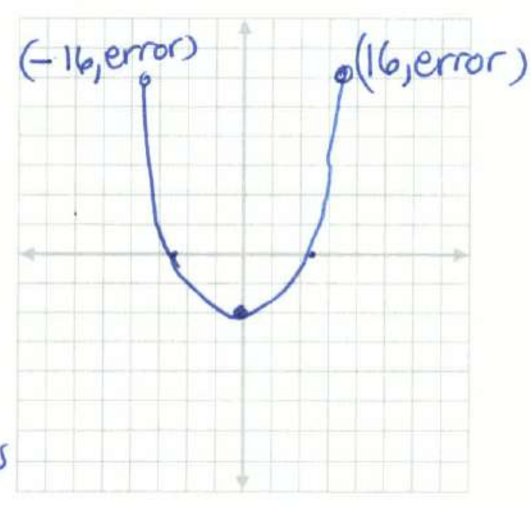
Decreasing on interval: $(-\infty, 0)$

VA: none

HA: none

Holes: none

calculator failure for x-values over 16



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