Name____ Date____________________ Period_______

TEST: Chapter 4.1-4.5 No Calculator

I. Multiple Choice: Place the capital letter of the answer choice in the blank to the left of the number.

_____ 1. $(\log_5 2)(\log_3 7)(\log_7 5) =$

(A) $\frac{\ln 3}{\ln 2}$ (B) $\log_3 2$ (C) $\log_3 5$ (D) $\log_7 2$ (E) 1

_____ 2. Solve for x: $2\cdot 3^{x+1} = 5^{2x}$

(A) $\frac{\ln 6}{\ln 25 - \ln 3}$ (B) $\frac{\ln 6}{\ln 25 - \ln 2}$ (C) $\frac{\ln 6}{\ln 25 - 1}$ (D) $\frac{\ln 6}{\ln 25 + \ln 3}$ (E) $\frac{\ln 6}{\ln 25 + \ln 2}$

_____ 3. Which of the following is equivalent to the function $f(x) = 9^x$?

(A) $g(x) = \log_9 x$ (B) $g(x) = \log_9 9^x$ (C) $g(x) = x\ln 9$ (D) $g(x) = e^{(\ln 9)x}$ (E) $g(x) = -9^{-x}$

_____ 4. What is constant percentage decay rate of $P(t) = 5.5(0.73)^t$?

(A) 173% (B) 50% (C) 73% (D) 27% (E) 55%

_____ 5. What is the domain of $y = -3 - 2\ln(20 - x^2 - x)$

(A) $(-5,4)$ (B) $(-4,5)$ (C) $(-\infty,-5)\cup(4,\infty)$ (D) $(-\infty,-4)\cup(5,\infty)$ (E) $(4,\infty)$

_____ 6. Which of the following is the inverse of $f(x) = 2\cdot 3^x$?

(A) $f^{-1}(x) = 0.5\log_3 x$ (B) $f^{-1}(x) = 3\log_2 x$ (C) $f^{-1}(x) = \log_3\left(\frac{x}{3}\right)$

(D) $f^{-1}(x) = \log_3\left(\frac{x}{2}\right)$ (E) $f^{-1}(x) = 2\log_3 x$

_____ 7. If $\log_8(x+5) + \log_8 x = \log_8 24$, then x equals

(A) 0 (B) 8 (C) 3 (D) -5 (E) -8

_____ 8. Solve for x by getting the bases the same: $\left(\frac{1}{25}\right)^{x+1}\left(\sqrt{5^{40}}\right) = \left(\frac{125}{\sqrt{5}}\right)^{2x}$

(A) $\frac{21}{9}$ (B) $\frac{18}{9}$ (C) $\frac{22}{3}$ (D) $\frac{21}{7}$ (E) $\frac{18}{7}$

_____ 9. $\log_{1/5} x^5 =$

(A) x (B) $-5\log_5 x$ (C) 5 (D) -5 (E) $5\log_5 x$

II. Free Response: **Show all work** in the space provided below the horizontal line. **Use correct units** where appropriate. **Give simplified, exact answers**.

10. The decibel level, D, of sound is given by the equation

$$D = 10\log\left(\frac{I}{I_0}\right)$$

where I is the intensity of the sound and $I_0 = 10^{-12}$ watts per square meter is the minimum intensity detectable by the human ear (such as the tick of a watch at 20 feet under quiet conditions).

(a) Assuming the shout of a single person, in general, measures a maximum of 80 decibels, find the intensity, I, of an 80 decibel shout. Show the work that leads to your answer.

(b) If a group of 10 people attend a math concert, and each one of them shouts at an 80 decibel level, how loud, in decibels, will the sound be of all 10 of them shouting at the same time? That is, how loud would the sound be **if the intensity, *I*, is increased by a factor of 10**?

(c) If the rustling of leaves creates 20 decibels, what is the intensity, I? Show the work that leads to your answer.

(d) If a jet taking off 100 feet away from you produces an intensity level of 100 watts per square meter, what is its decibel level? Show the work that leads to your answer.

$D = 10\log\left(\frac{I}{I_0}\right), I_0 = 10^{-12}$

(a) $80 = 10\log_{10}\left(\frac{I}{10^{-12}}\right)$

$8 = \log_{10}\left(\frac{I}{10^{-12}}\right)$ ✓1

$10^8 = \frac{I}{10^{-12}}$

$I = (10^8)(10^{-12})$ ✓2

$\boxed{I = 10^{-4} \text{ or } \frac{1}{10^4} \text{ or } \frac{1}{10000}}$ watts/m²

*No Deduction for missing or incorrect units.

* 1st check on each one is for a setup or step in the right direction

(b) If $I = 10 \cdot 10^{-4}$

$D = 10 \cdot \log_{10}\left(\frac{10 \cdot 10^{-4}}{10^{-12}}\right)$ ✓3

$D = 10 \cdot \log_{10}(10^9)$

$\boxed{D = 90 \text{ decibels}}$ ✓4

(c) $D = 20$

$20 = 10 \cdot \log_{10}\left(\frac{I}{10^{-12}}\right)$

$10^2 = \frac{I}{10^{-12}}$ ✓5

$I = 10^2 \cdot 10^{-12}$

$\boxed{I = 10^{-10} \text{ or } \frac{1}{10^{10}}}$ watts/m² ✓6

(d) $I = 100 = 10^2$

$D = 10 \cdot \log_{10}\left(\frac{10^2}{10^{-12}}\right)$ ✓7

$D = 10 \cdot \log_{10}(10^{14})$

$\boxed{D = 140 \text{ Decibels}}$ ✓8

8 CHECKS