Name_____ Date_____ Period_____

TEST: Chapter 4.1-4.2 FORM A, CALCULATOR PERMITTED

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

E 1. The graph of the function $g(x)=8^{x+1}$ can be obtained from the graph of $f(x)=2^x$ by

(A) Horizontally compressing f by a factor of 3 (B) Horizontally stretching f by a factor of 3

(C) Horizontally shifting f left one unit (D) Horizontal shifting f right one unit (E) None of these

$g(x)=(2^3)^{x+1}=2^{3(x+1)}$ could be horizontal compression by 3 and shifts left one unit

E 2. What is constant percentage decay **rate** (as a percentage) of $P(t)=1.23(0.951)^t$?

$=1.23(1-0.049)^t$

(A) 95.1 (B) 9.51 (C) 1.23 (D) 23 (E) 4.9

A 3. What is the growth **factor** in the equation $M(t)=3\left(\frac{5}{2}\right)^t$? Growth "factor" is not percent!

(A) 2.5 (B) 1.667 (C) 250% (D) 167% (E) 3

E 4. What is the equation of the exponential model, $y=Ab^t$, t in weeks, for quantity that starts with an initial value of 5, and **decreases** by a factor of 5 every week?

(A) $y=5\left(\frac{1}{5}\right)^{1/t}$ (B) $y=5^{t-1}$ (C) $y=\left(\frac{1}{5}\right)5^t$ (D) $y=5^{t+1}$ (E) $y=5^{1-t}$

$y=5\left(\frac{1}{5}\right)^t=5(5)^{-t}$ $\}$ $y=5^{1-t}$

A 5. What is the equation of the exponential model, $y=Ab^t$, t in hours, for quantity that starts with an initial value of 3.4, and **increases** by 200% every day?

(A) $y=3.4\left(3^t\right)$ (B) $y=3.4\left(3^{t/24}\right)$ (C) $y=3.4\left(2^t\right)$ (D) $y=3.4\left(2^{t/24}\right)$ (E) $y=3.4\left(200^{t/24}\right)$

$y=3.4(1+2)^t$

D 6. Which of the following is equivalent to the function $f(x)=7^x$?

(A) $g(x)=-\left(\frac{1}{7}\right)^{-x}$ (B) $g(x)=\left(\frac{1}{7}\right)^x$ (C) $g(x)=-\left(\frac{1}{7}\right)^x$ (D) $g(x)=\left(\frac{1}{7}\right)^{-x}$ (E) $g(x)=-7^{-x}$

$=7^x$

C 7. A single cell amoeba triples every 4 days. About how long will amoeba to produce a population of 5000?

$y=1(3)^{t/4}$

(A) 11 days (B) 21 days (C) 31 days (D) 41 days (E) 51 days

A 8. If a particle has an initial mass of 250 grams and doubles its mass every 7.5 hours, then what is the approximate mass of the particle at $t=2$ hours?

$y=250(2)^{t/7.5}$

(A) 300.8 g (B) 8192000 g (C) 468750 g (D) 14062.5 g (E) 8333.3 g

B 9. For $x>0$, which of the following is true?

(A) $3^x>4^x$ (B) $7^x>5^x$ (C) $\left(\frac{1}{6}\right)^x>\left(\frac{1}{2}\right)^x$ (D) $9^{-x}>8^{-x}$ (E) $0.17^x>0.32^x$

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

10. The number of people at Wassailfest infected with holiday cheer after t minutes is modeled by the function

$$W(t) = \frac{12456}{1+56e^{-0.7t}}$$

(a) What was the initial number of Wassailers infected with cheer? (**round** to the nearest person)
(b) After how many minutes will the number of infected Wassailers be 5000? Give an approximation **rounded** to the nearest minute.
(c) After how many minutes is the holiday cheer spreading at the fastest rate? (**round** to the nearest minute)
(d) How many Wassailers are infected after a 15 minutes? (**round** to the nearest person)
(e) According the model, how many people attended Wassailfest?
(f) If the Grinch has a plan to crash the Wassailfest festivities if 75% of the Wassailers get infected with the holiday spirit, after how many minutes will he try to implement his sinister plan? (**round** to the nearest minute)

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a) $w(0) = 218.526$
≈ 219 Wassailers

b) $w(t) = 5000$
$t = 5.179$
≈ 5 minutes

c) $w(t) = 12456/2 = 6228$
$t = 5.750$
$t \approx 6$ min

d) $w(15) = 12436.822$
≈ 12437 wassailers

e) 12456 wassailers

f) $w(t) = (0.75)(12456) = 9342$
$t = 7.319$
$t \approx 7$ min