

## Practice TEST: Chapter 3.1-3.4 CALCULATOR PERMITTED

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

\_\_\_\_\_ 1.  $\log_3 2 \approx$

- (A) 0.30103 (B) 0.4771 (C) 0.6309 (D) 0.5991 (E) 1.585

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

- (A)
- $f^{-1}(x) = \left(\frac{1}{3}\right)^x$
- (B)
- $f^{-1}(x) = -(3^x)$
- (C)
- $f^{-1}(x) = \log_{1/3}(x)$
- 
- (D)
- $f^{-1}(x) = \log_3(x)$
- (E) None of these

\_\_\_\_\_ 3.  $\ln e^x =$

- (A) 0 (B) 1 (C)
- $x$
- (D)
- $\ln x$
- (E)
- $e^x$

\_\_\_\_\_ 4. What is constant percentage growth rate of  $P(t) = 1.23 \cdot 1.049^t$  ?

- (A) 4.9% (B) 23% (C) 49% (D) 2.3% (E) 1.23%

\_\_\_\_\_ 5. Which of the following is equivalent to the function  $f(x) = 5^x$  ?

- (A)
- $g(x) = \log_5 x$
- (B)
- $g(x) = e^{(\ln 5)x}$
- (C)
- $g(x) = x \ln 5$
- (D)
- $g(x) = x^5$
- (E)
- $g(x) = -5^{-x}$

\_\_\_\_\_ 6. A single cell amoeba doubles every 4 days. About how long will amoeba to produce a population of 1000?

- (A) 10 days (B) 20 days (C) 30 days (D) 40 days (E) 50 days

\_\_\_\_\_ 7. Which of the following is NOT true about every exponential function of the form  $y = b^x$  ?

- (A) increasing (B)
- $y$
- intercept at 1 (C) Horizontal Asymptote at
- $y = 0$
- 
- (D) Domain of all real numbers (E) No
- $x$
- intercept

\_\_\_\_\_ 8. Solve the following equation:  $2 \log_3(x - 5) = 4$ .  $x =$

- (A) 5 (B) nonexistent (C) -5 (D) 8 (E) 14

\_\_\_\_\_ 9. What is the domain of  $y = -3 - 2 \ln(2 - 4x)$

- (A) all real numbers (B)
- $\left(-\infty, \frac{1}{2}\right)$
- (C)
- $\left(-\infty, -\frac{1}{2}\right)$
- (D)
- $\left(\frac{1}{2}, \infty\right)$
- (E)
- $\left(-\frac{1}{2}, \infty\right)$

\_\_\_\_\_ 10. If a particle has an initial mass of 250 grams and doubles its mass every 7.5 hours, then the equation of the exponential function models its mass  $M$  in grams at any time  $t$  in hours,  $t \geq 0$  is given by

- (A)
- $M = 250(7.5^t)$
- (B)
- $M = 250(2^{15t/2})$
- (C)
- $M = 7.5(250^t)$
- (D)
- $M = 250(2^{2t/15})$
- (E)
- $\frac{2}{15}(250^t)$

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

11. The number of students infected with the flu at New Braunfels High School after  $t$  days is modeled by the function

$$P(t) = \frac{2150}{1 + 90e^{-0.2t}}$$

- (a) What was the initial number of infected students? (round to the nearest student)
  - (b) When will the number of infected students be 250? (round to the nearest day)
  - (c) When is the flu spreading at the fastest rate? (round to the nearest day)
  - (d) How many students are infected on the 30<sup>th</sup> day? ( $t = 30$ ) (round to the nearest student)
  - (e) What is the population of the school?
  - (f) If the school has a policy to close the school if 30% of the student population gets the flu, when will the school close? (round to the nearest day)
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12. The amount  $C$  in grams of carbon-14 present in a certain substance after  $t$  years is given by

$$C = 20e^{-0.0001216t}$$

- (a) What was the initial amount of carbon-14 present?
  - (b) How much is left after 10400 years?
  - (c) When will the amount left be 10 g?
  - (d) When will the amount be 0 g? Justify.
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13. Solve each of the following. Show all work and find simplified, exact solutions.

(a)  $4^{x+2} = 5^{x+7}$

(b)  $\log_3(x+1) + \log_3(x-7) = 2$

(c)  $\left(\frac{1}{4}\right)(\sqrt{2})^{3x-2} = \left(\frac{32}{\sqrt{8}}\right)^{x-1}$

(d)  $2 \log_{25} x - \log_5(4x-9) = 2$