

Test #7: Unit #6 – Analysis of Logarithmic Functions

Name _____ Date _____ Period _____

Multiple Choice	× (9/7)	
Free Response	× 1	
Total Score out of 36		

MULTIPLE CHOICE – Calculator Permitted1. Find the value of $3\log_2 7 - \ln 2$.

A. 3.406

B. 0.375

C. 2.114

D. 7.729

E. Operation cannot be performed

2. The function $B(t) = 250e^{0.0693t}$ gives the number of bacteria in a culture dish t hours after the initial population is placed in the dish. After how many hours has the initial population tripled?

A. 15.853 hours

B. 10.002 hours

C. 1.585 hours

D. 1.000 hours

E. 12.182 hours

3. Order the expressions $\log_{20} 4$, $2\ln e^{-3}$, and $e^{-2\ln 4}$ from least to greatest.A. $\log_{20} 4$ $e^{-2\ln 4}$ $2\ln e^{-3}$ B. $2\ln e^{-3}$ $e^{-2\ln 4}$ $\log_{20} 4$ C. $\log_{20} 4$ $2\ln e^{-3}$ $e^{-2\ln 4}$ D. $2\ln e^{-3}$ $\log_{20} 4$ $e^{-2\ln 4}$ E. $e^{-2\ln 4}$ $2\ln e^{-3}$ $\log_{20} 4$

4. The solution to the equation $3^{2x} = 5^{x-1}$ lies on which of the following intervals?

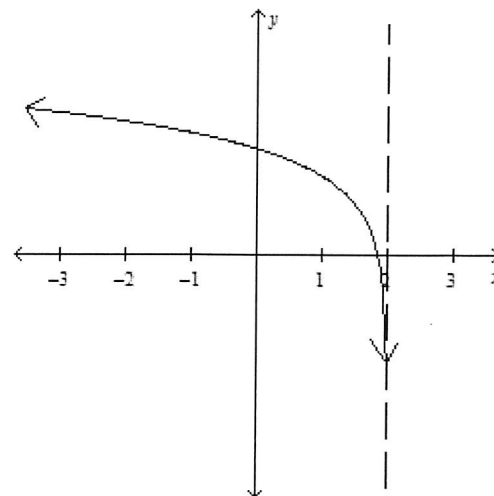
- A. $-3 < x < -2$
- B. $-2 < x < -1$
- C. $-1 < x < 0$
- D. $0 < x < 1$
- E. $1 < x < 2$

5. Solve for x : $\log(7-x) - \log(3x+2) = 1$

- A. $\frac{19}{31}$
- B. $-\frac{13}{31}$
- C. $-\frac{27}{29}$
- D. $\frac{9}{4}$
- E. 7

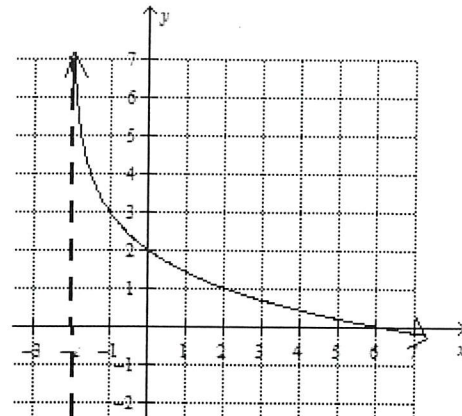
6. Which of the functions below could be the function whose graph appears to the right?

- I. $f(x) = \log_b(x-2)$
- II. $g(x) = \log_b(-x+2)$
- III. $h(x) = \log_b(6-3x)$



- A. I only
- B. I and II only
- C. II only
- D. III only
- E. II and III only

7. Pictured to the right is the graph of a logarithmic function, $h(x)$.
Use the graph to determine which statements below are true.



- I. The graph of $h^{-1}(x)$ has a y -intercept of $(0, 6)$.
 II. The argument of the function $h(x)$ could be $(x - 2)$.
 III. The graph of $h^{-1}(x)$ lies above its horizontal asymptote.
- A. I only B. II only C. III only
 D. II and III only E. I and III only

FREE RESPONSE

Biologists can estimate the age of an African elephant based on the length of an elephant's footprint using the function

$$L(t) = 45 - 25.7e^{-0.09t},$$

where $L(t)$ represents the length of the footprint in centimeters and t represents the age of the elephant in years.

The age of an African elephant can also be based on the diameter of a pile of elephant dung using the function

$$D(t) = 16.433(1 - e^{-0.093t - 0.457}),$$

where $D(t)$ represents the diameter of the pile of dung in centimeters and t represents the age of the elephant in years.

- a. Find the value of $L(0)$. Using correct units of measure, explain what this value represents in the context of this problem.

- b. Find the value $D(15)$. Using correct units of measure, explain what this value represents in the context of this problem.

c. During the first 50 years of an African elephant's life, will the diameter of its pile of dung ever be the same as the length of its footprint? If so, at what age? Explain how you arrived at your answer by investigating the graphs of $L(t)$ and $D(t)$.

d. Solve the equation $L(t) = 36$ to the nearest whole number. Using correct units of measure, explain what the solution to this equation represents in the context of this problem. Show your algebraic work.

Pre-AP Calculus
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MULTIPLE CHOICE – Calculator NOT Permitted

8. Which of the following statements is/are true?

I. $\log_4 \frac{1}{64} = -4$

II. $\log_2 2^{x-3} = x - 3$

III. $\log_b \sqrt[5]{b^2} = \frac{2}{5}$

- A. I, II, and III
- B. II only
- C. II and III only
- D. I and III only
- E. III only

9. Write the expanded logarithmic expression $\frac{1}{2} \log x + 2 \log y - \log z$ in condensed form.

A. $\log \frac{y^2 \sqrt{x}}{z}$

B. $\log \frac{2y \sqrt{x}}{z}$

C. $\log \frac{\sqrt{xy^2}}{z}$

D. $\log \frac{\sqrt{x}}{y^2 z}$

E. $\log y^2 z \sqrt{x}$

10. Between what two integers does the value of $\log_4 53$ lie?

A. 16 and 64

B. 2 and 3

C. 3 and 4

D. 13 and 14

E. None of these

11. What is the equation of the asymptote of the inverse function, $f^{-1}(x)$, if $f(x) = 2^{x-2} + 3$?

A. $x = 3$

B. $y = 2$

C. $y = -2$

D. $x = 2$

E. $y = 3$

x	-7	-4	-1	2	5	8	11
$H(x)$	-125	-13	1	2.75	2.969	2.996	2.999

12. A table of values for the exponential function $H(x) = a \cdot b^x + c$ is pictured above. Which of the statements below is/are true?

I. The graph of $H^{-1}(x)$ lies to the right of the vertical asymptote.

II. The value of c in the equation of $H(x)$ is 3.

III. The argument of $H^{-1}(x)$ could be $(x - 3)$.

A. III only

B. I and III only

C. II and III only

D. II only

E. I, II and III

13. Consider the logarithmic function $f(x) = \log_3(2 - 3x)$ to determine which of the following statements is/are true.

I. The value of $x = 3$ is in the domain of the function $f(x)$.

II. The value of $f(-1)$ is between 1 and 2, but closer to 1.

III. The graph of $f^{-1}(x)$ has a horizontal asymptote at $y = \frac{2}{3}$.

A. I only

B. I and II only

C. II only

D. II and III only

E. III only

14. Solve for x : $3 - e^{2x+3} = 1$

A. $x = \frac{-3 + \ln(2)}{2}$

B. $x = \frac{-3 - \ln(2)}{2}$

C. $x = \frac{3 - \ln(2)}{2}$

D. $x = \frac{-3 + \ln(-2)}{2}$

E. No Solution

FREE RESPONSE

Consider the logarithm functions below to answer the following questions.

$$f(x) = -2 + \ln(6 - 2x)$$

$$g(x) = 2 \ln x + \ln(x + 2)$$

a. For what value(s) of x is $f(x) = 5$. Leave your answer(s) in terms of e .

b. Identify the equation of the vertical asymptote of the graph of $f(x)$. Does the graph lie to the left or to the right of the vertical asymptote? Show your work and explain your reasoning.

c. Find the equation of $f^{-1}(x)$ in the form $f^{-1}(x) = a \cdot b^{x+c} + d$. Show your work.

d. For what value(s) of x does $g(x) = \ln(3x)$. Show your work.